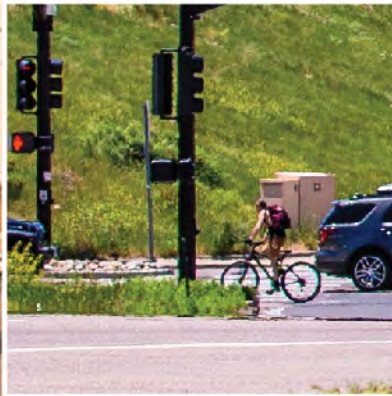




Santa Fe PEL C-470 to I-25



CORRIDOR CONDITIONS REPORT

November 2020



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ACRONYMS AND ABBREVIATIONS

ACS	American Community Survey
APE	Area of Potential Effects
AVO	average vehicle occupancy
CCTV	Closed-circuit television
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNHP	Colorado Natural Heritage Program
COVID-19	coronavirus disease 2019
CPW	Colorado Parks and Wildlife
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
DMS	Dynamic Message Signs
DRCOG	Denver Regional Council of Governments
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
FACWet	Functional Assessment of Colorado Wetlands
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
GIS	Geographic Information System
HPS	high-pressure sodium
HOV	High-Occupancy Vehicle
HUD	U.S. Department of Housing and Urban Development
IPaC	Information, Planning and Conservation
ISA	Initial Site Assessment
ITS	Intelligent Transportation Systems
LED	light-emitting diode
LRT	light rail transit
MESA	Modified Environmental Site Assessment
MP	mileposts



mph	miles per hour
MS4	Municipal Separate Storm Sewer System
NAAQS	National Ambient Air Quality Standards
NAD	No action determination
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NRHP	National Register of Historic Places
OAHP	Office of Archaeology and Historic Preservation
PEC	potential environmental concerns
PEL	Planning and Environmental Linkages
PM ₁₀	particulate matter less than 10 microns in diameter
PM _{2.5}	particulate matter less than 2.5 microns in diameter
PTI	planning time index
REC	recognized environmental conditions
RTD	Regional Transportation District's
SFHA	Special Flood Hazard Areas
SHPO	State Historic Preservation Officer
TAZ	Transportation Analysis Zones
TMC	Turning movement counts
TTI	travel time index
U.S.	United States
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USDOT	United States Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCRP	Voluntary Cleanup and Redevelopment Program
VIA	Visual Impact Assessment
WOUS	Wetlands and other waters of the United States

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1. Introduction and Project Limits

The Colorado Department of Transportation (CDOT) is conducting a Planning and Environmental Linkages (PEL) study for an 11-mile stretch of Santa Fe Drive (U.S. Highway 85) between Central 470 (C-470) and the junction of Alameda Drive and Interstate 25 (I-25) (Santa Fe Drive corridor). The *Santa Fe Drive PEL Study (C-470 to I-25)* will identify transportation issues and environmental concerns on the Santa Fe Drive corridor and develop short- and long-term alternatives that create a clear vision for the transportation functions in the corridor.

Owned and operated by CDOT, Santa Fe Drive is a significant north-south inter-regional highway from Castle Rock to Denver, and is primarily defined as an expressway within the project limits. Within the study area it traverses three counties and four municipalities that are funding partners in the study: Arapahoe County, City and County of Denver, Douglas County, City of Englewood, City of Littleton, and City of Sheridan.

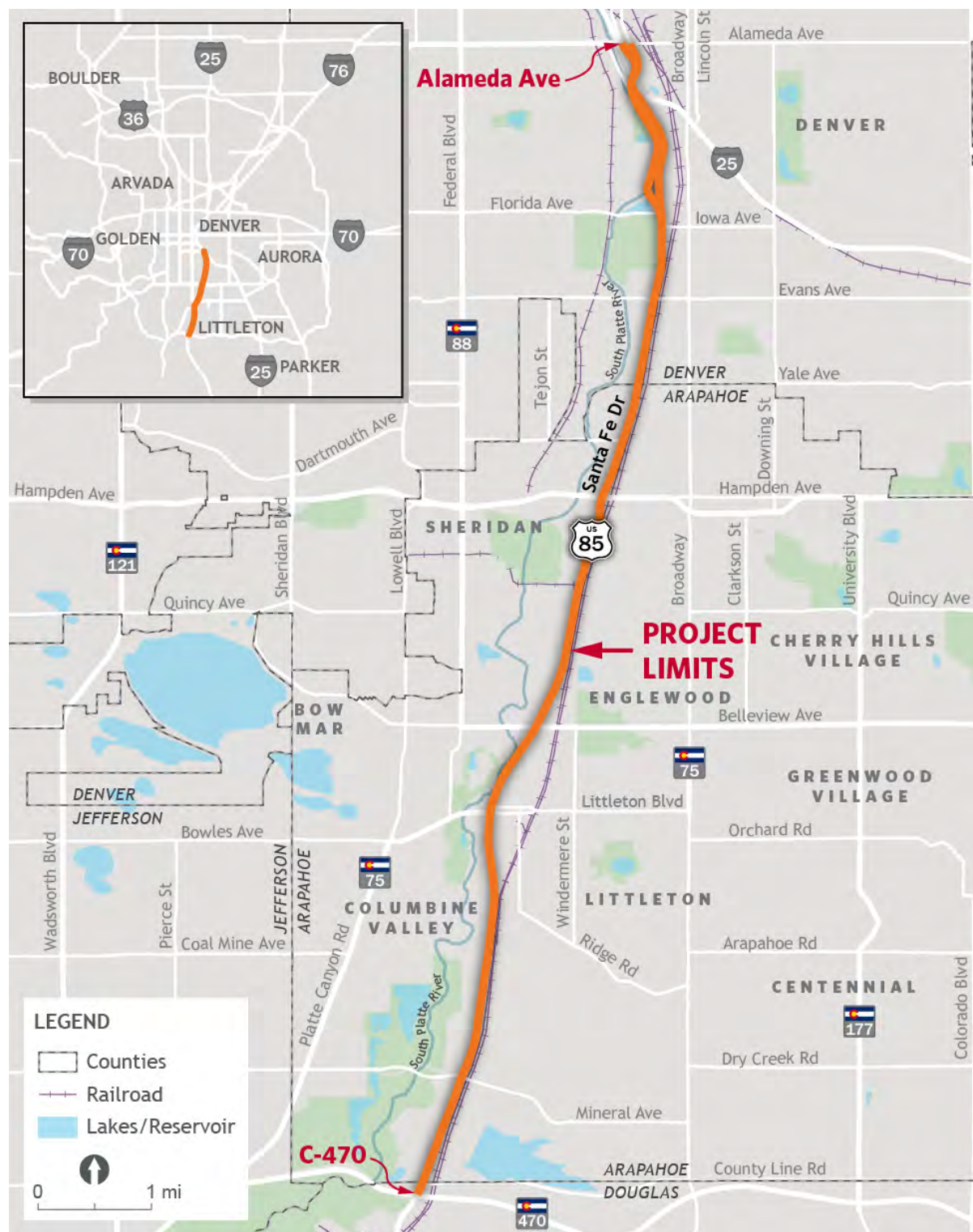
The PEL study process generally has five primary steps. All of the steps involve two-way engagement between the project team and the interested stakeholders, including the general public, property owners, resource agencies and local government partners. Stakeholders are engaged throughout the process to draw out their ideas and suggestions and to develop support and ultimately consensus on the study's recommendations.

- **Existing conditions** is the first step that analyzes and identifies the key issues along the corridor and the causes of the issues.
- **Purpose and need** is a statement that defines the core reasons why the project was initiated. It is used to guide decisions and it provides the first criterion in the alternatives evaluation process. Goals and objectives can be defined in addition to the purpose and need.
- **Alternatives development** is the process by which different solutions to the identified issues are generated and packaged together to solve the purpose and need of the project.
- **Alternatives evaluation** and selection is the process used to analyze and refine the different options identified during alternatives development. As part of this process, a No Action alternative that includes what improvements are already expected to occur in the corridor is used as a comparison against the study alternatives. Alternatives can be eliminated, refined, or carried forward into future phases of the project development process.
- **Project phasing** is the final step in which project implementation strategies are identified for the selected alternatives.

This *Corridor Conditions Report* represents the initial phase of the PEL study process. It summarizes the existing conditions infrastructure; travel conditions; and the social, built, and natural environmental resources within the Santa Fe Drive corridor. The summary will be used to guide the subsequent parts of the PEL process.

Figure 1 shows the project location in the context of the Denver metropolitan area and the project limits.

Figure 1. Santa Fe Drive PEL Study (C-470 to I-25) Project Limits



2. Planning Context

This section includes information about individual plans developed by communities along the Santa Fe Drive corridor that address local land use considerations. This information provides useful context for developing a Santa Fe Drive corridor vision, and assessing potential future improvements along the corridor that fit within the primary function of the highway.

2.1 Review of Previous Planning Efforts

Many previous planning efforts have been completed that consider improvements related to the Santa Fe Drive corridor. A review of existing plans provides a baseline for future improvement recommendations.

2.1.1 Land Use Plans

The Denver Regional Council of Governments' (DRCOG) *Metro Vision* (DRCOG, 2019a), the regional plan for the Denver metro area, is summarized followed by a discussion of land use and comprehensive planning documents published by local governments.

DENVER REGIONAL COUNCIL OF GOVERNMENTS***Metro Vision: Our place, our plan***

Date Completed	As Amended, 2019
Plan Link	https://adobeindd.com/view/publications/8bb0b608-d82e-44da-8303-e379416c7e5a/2ird/publication-web-resources/pdf/RPD-RP-METROVISION-20-02-12-v1-epub.pdf
Plan Purpose	The purpose of the regional plan is to safeguard regional quality for coming generations.
Primary Goals	<ul style="list-style-type: none"> ➤ Promote regional cooperation beyond jurisdictional boundaries. The plan's five themes describe the region's desired future. The themes are as follows: <ul style="list-style-type: none"> ● An efficient and predictable development pattern ● A connected multimodal region ● A safe and resilient natural and built environment ● Healthy, inclusive and livable communities ● A vibrant regional economy
Vision Pertaining to Santa Fe Drive	<ul style="list-style-type: none"> ➤ By 2040, 25 percent of the region's housing and 50 percent of the region's employment is to be in urban centers. DRCOG has designated a few urban centers near the Santa Fe Drive corridor, including Alameda Station, I-25/Broadway Station, Evans Station, Englewood CityCenter, and Downtown Littleton. ➤ The plan lists options available to local organizations and governments to contribute to <i>Metro Vision</i> (DRCOG, 2019a). Many of them are relevant to the Santa Fe Drive corridor. Examples include: <ul style="list-style-type: none"> ● Adopt land use policies and development regulations to support compact, mixed-use development patterns and expanded housing options. ● Direct new housing and employment to urban centers. ● Promote infill and redevelopment through zoning changes. ● Reflect local growth priorities with local regulations and policies that align land use, transportation, and infrastructure planning to focus urban development within the region's urban growth boundaries.

DOUGLAS COUNTY***Comprehensive Master Plan 2040: Vision, Balance, Community***

Date Completed	2019
Plan Link	https://apps.douglas.co.us/planning/projects/download.aspx?PosseObjectId=64569763
Plan Purpose	The plan is intended to serve as the foundation for the County's future growth and development, and is intended to provide decision makers with guidance on how to maintain and improve identified community values.
Primary Goals	<ul style="list-style-type: none"> ➤ The plan's vision is to reflect, acknowledge, and balance the common values, rights, and needs of residents and landowners, and honor and protect its unique, diverse communities and resources. ➤ The far northwestern corner of the county situated south of W. County Line Road and west of Santa Fe Drive is predominately comprised of Chatfield State Park. ➤ All other areas west and east of Santa Fe Drive are classified as a Primary Urban Area, which aligns with the Highlands Ranch Metro District boundary.
Vision Pertaining to Santa Fe Drive	<ul style="list-style-type: none"> ➤ Growth is to be directed to PUAs to minimize investments in public and private infrastructure. ➤ PUAs are classified for urban uses, including shopping and services, and the plan seeks to create compact, urban form in such areas. ➤ The plan supports the provision of travel facilities for all potential users within transportation corridors, noting that multiuse transportation corridors can positively affect community and personal interaction, reduce drive times, and increase access opportunities for non-drivers. A specific objective of the plan is to promote a multimodal transportation network that provides access to major collectors and arterial highways, transit, sidewalks, and trails; and links activity centers.

ARAPAHOE COUNTY

Comprehensive Plan

Date Completed	As Amended, 2020
Plan Link	https://www.arapahoegov.com/DocumentCenter/View/9445/2018-Comprehensive-Plan-with-Amendments-thru-1-24-2020
Plan Purpose	The plan is intended to guide land use, growth, and development decisions—looking beyond current pressing issues to provide a perspective on opportunities for the future.
Primary Goals	<ul style="list-style-type: none"> ➤ The plan illustrates a generalized pattern of future land use, serves as a policy and strategy guide to update the County's land use regulations, and establishes the foundation for new programs. ➤ Because land in the western one-fourth of the Arapahoe County is primarily already developed or situated within municipal boundaries, this plan develops a framework for future development in the eastern three-fourths of the County.
Vision Pertaining to Santa Fe Drive	<ul style="list-style-type: none"> ➤ A few unincorporated properties are located west of Santa Fe Drive between W. Oxford Avenue and W. Stanford Avenues They are located just north of Centennial Park in Englewood and immediately adjacent to Santa Fe Drive just north of Stanford Avenue. All of these properties are within what the plan calls the Urban Area, which is identified as a priority growth area consistent with the DRCOG <i>Metro Vision</i> (DRCOG, 2019a) and noted as the place of the most intense urban activity where annexations will likely occur. ➤ The plan identifies the area west of South Platte Canyon Road from W. Bowles Avenue to west of South Platte Reservoir (along CO 75) as an Urban Residential Area in the Urban Area Land Use Plan, which calls for residential neighborhood development, including a variety of housing types combined with non-residential secondary land uses that are supportive of the residential uses.

CITY OF LITTLETON***Envision Littleton Comprehensive Plan***

Date Completed	2019
Plan Link	https://www.littletongov.org/home/showdocument?id=21312
Plan Purpose	The plan sets a long-range vision regarding growth and community enhancement, identifies areas where new development and redevelopment may occur, assesses near- and long-term needs and desires across topics that represent the key “building blocks” of a community, serves as a guideline for measuring success, and a “living document” able to address changing circumstances.
Primary Goals	<ul style="list-style-type: none"> ➤ The plan is intended to guide future development, redevelopment, and community enhancement efforts through 2040. ➤ The 2040 land use vision includes maintaining the integrity of established neighborhoods, protecting the natural setting, and enhancing navigability.
Vision Pertaining to Santa Fe Drive	<ul style="list-style-type: none"> ➤ A large amount of Littleton consists of suburban residential neighborhoods, which are envisioned to remain. This includes most of the area east of Santa Fe Drive to S. Broadway between Littleton Boulevard and W. Mineral Avenue. ➤ Four primary areas of likely change and desired land uses adjacent to Santa Fe Drive are: <ul style="list-style-type: none"> ● The intersection of Santa Fe Drive and W. Belleview Avenue is to be a mix of auto-oriented commercial (strip and big box commercial, restaurant chains, office, hotel and mixed use development) near the intersection and a mix of uses, including residential, encouraged west to Irving Street. ● In and near downtown is to include a mix of uses on single sites and within individual buildings, as well as live/work units, commercial retail and services, offices, and entertainment uses. ● West of Santa Fe Drive from the Denver Seminary south to C-470 is particularly intended for a greater focus on “destination” developments that creatively mix uses, including residential; integrate amenities; and emphasize quality design. Most land use types are envisioned except industrial uses. ● East of Santa Fe Drive, on the northeast corner of Santa Fe and C-470, is an area envisioned to continue to focus on business park uses and commercial development. ➤ Almost the entire Broadway corridor north of W. Fremont Avenue is envisioned as an area for a mix of uses, with more auto-oriented and suburban commercial activity south of W. Fremont Avenue. ➤ Sets a goal for an ecologically sound and exceptionally attractive South Platte River corridor, framed by sensitively planned land uses, that continues to anchor the trail and open space networks.

CITY OF LITTLETON

Littleton Corridor
and Area Plans

Envision Littleton was developed, in part, by reviewing previous plans and studies prepared by the City of Littleton. It replaced all comprehensive plans previously adopted by the City (the 2016 Neighborhood and Corridor Plans, the 2013 Small Area Plan, and the 2011 Downtown Neighborhood Plan). While there was a corridor plan for Santa Fe Drive in the 2013 Small Area Plan document, it was superseded by *Envision Littleton*. The most recent relevant small area plans are:

- ▶ *Bellevue Avenue Corridor Vision (City of Littleton, 2018a)*. Land uses outlined in this plan are generally aligned with those in *Envision Littleton*'s future land use map. This plan includes specific recommendations for opportunity areas identified near Santa Fe Drive, among them the former Columbine Square Shopping Center, Centennial Square Shopping Center, and the Riverside Downs Center. Redevelopment of these areas recognizes shifts in development models for residential, retail, office, and hospitality uses, leading to even greater focus on “destination” developments that creatively mix uses, integrate amenities, and emphasize quality design.
- ▶ *Mineral Station Area Framework (City of Littleton, 2018b)*. This plan acknowledges that existing land uses at the time were well established, including recreation to the west of the station, commercial immediately north, and residential in all directions farther from the station. It highlighted the 110-acre undeveloped private property south of W. Mineral Avenue, which is the location of the Santa Fe Park project in the planning and development pipeline, which has been designated as a Corridor Mixed Use community character category under *Envision Littleton*.
- ▶ *Santa Fe & Mineral Intersection Study (City of Littleton, 2019c)*. Littleton conducted a study of the intersection of Santa Fe Drive and Mineral Avenue to analyze potential solutions to mitigate congestion and improve safety both at the intersection and along the study corridors. Recognizing that the long-term solution may involve an expensive grade-separated interchange, the City is seeking a more affordable interim solution. The study found four at-grade alternatives that could provide an interim solution which were a continuous flow intersection, northwest quadrant roadway, southwest quadrant roadway, or dual quadrant roadway. Littleton intends to do additional analysis to confirm how to move forward.

CITY OF SHERIDAN

Comprehensive Plan 2015

Date Completed	2015
Plan Link	https://www.ci.sheridan.co.us/DocumentCenter/View/661/Sheridan-Comprehensive-Plan_Final?bidId=
Plan Purpose	To manage Sheridan's growth and respond to changing circumstances while continuing to meet the needs of its residents and retain the quality of life that initially attracted residents.
Primary Goals	<ul style="list-style-type: none"> ➤ The plan focuses on residents and visitors and their connection to and interaction with neighborhoods, nature, and trails and infrastructure. ➤ The plan's economic development goals focus on a variety of topics, including business recruitment, retention, and expansion through economic diversification and encouraging an environment where existing businesses thrive. ➤ The plan identifies Sheridan's neighborhoods, with those adjacent to Santa Fe Drive from north to south as The Bottoms, River Point and the South Santa Fe Business Park.
Vision Pertaining to Santa Fe Drive	<ul style="list-style-type: none"> ➤ The Bottoms Neighborhood is located between S. Zuni Street and Santa Fe Drive north of US 285 (W. Hampden Avenue) to W. Floyd Avenue. Proposed development ideas in this neighborhood seek to have a "LoDo type feel" with additional business and mixed-use development with restaurants along the South Platte River. ➤ The River Point Neighborhood is located west of Santa Fe Drive to South Clay Street and from W. Hampden Avenue south to W. Oxford Avenue. It represents just over 30 percent of the community's land area and is currently dominated by a golf course and a major shopping center. The plan seeks to ensure this "Jewel in Sheridan's Crown" remains a regional draw and economic driver with additional residential along W. Hampden Avenue. ➤ South Santa Fe Business Park to the south of River Point from W. Oxford Avenue south to W. Union Avenue represents the city's second largest neighborhood by area and consists almost entirely of industrial uses, including outdoor storage and vacant properties. The plan's goals include redeveloping this area into a high quality commercial and industrial job-producing district with supporting high-density residential and recreational amenities. Proposed development ideas include mixed-use business and residences oriented toward the river and an outdoor event area and cafes along the river.

CITY OF ENGLEWOOD***Englewood Forward Comprehensive Plan***

Date Completed	2016
Plan Link	https://www.englewoodco.gov/home/showdocument?id=17175
Plan Purpose	The plan is intended to guide the private development community to invest in and build appropriately scaled projects in locations according to the existing layout of the city and the values of its citizenry.
Primary Goals	<ul style="list-style-type: none"> ➤ The plan lays out a vision informed by six themes: Live, Work, Shop, Play, Learn, and Move. ➤ Of the six themes, the goals associated with the Work and Move themes are most relevant to Santa Fe Drive given its prominence as an employment and transportation spine. Identified goals focus on supporting local and regional businesses and enhancing multimodal mobility through maintenance and improvement of all transportation corridors.
Vision Pertaining to Santa Fe Drive	<p>The Santa Fe Drive corridor and adjacent land in Englewood is currently primarily used for industrial and commercial activities.</p> <p>Primary catalytic activities and mixed-use transition areas are identified in the plan by neighborhood. These are areas where redevelopment is poised to occur, or where change is likely to occur. Adjacent to the Santa Fe Drive corridor, they are identified in the plan in the following locations:</p> <ul style="list-style-type: none"> ➤ South Platte Neighborhood: West of Santa Fe Drive from W. Yale Avenue to just north of W. Hampden Avenue. Future uses include high density residential and employment. ➤ Cushing Park: East of Santa Fe Drive bounded by W. Yale Avenue, W. Floyd Avenue and S. Broadway. Future uses include residential and neighborhood retail. ➤ Downtown/Englewood Station Area: East of Santa Fe Drive, bounded by W. Floyd Avenue, W. Kenyon Avenue, and Sherman Street. Future uses include major retail, employment, and high-density residential. A future Englewood Station pedestrian bridge over Santa Fe Drive between W. Floyd Avenue and W. Girard Avenue is called for. ➤ Oxford Station Area: East of Santa Fe Drive, along the Santa Fe Drive corridor between W. Kenyon Avenue and W. Tufts Avenue. Future uses include employment, high density residential, and neighborhood retail. ➤ Belleview/Brookridge Area: East of Santa Fe Drive bounded by W. Tufts Avenue, W. Belleview Avenue and S. Broadway. Future uses include residential and major retail.

CITY OF ENGLEWOOD**City of Englewood
Small Area Plans**

The City of Englewood has adopted several small area plans over the years. Key recommendations have been incorporated into the Englewood Forward Comprehensive Plan. The most recent relevant small area plans are:

- *Englewood Light Rail Corridor Plan (City of Englewood, 2013)*. Identifies the functions, character, uses, and design elements for each station area within Englewood and the public infrastructure needed. The plan is focused around the existing Englewood and Oxford light rail stations, and the future Bates light rail station. The corridor is envisioned as a series of inter-related and complementary station area neighborhoods that support and strengthen each other, knitted together with enhanced 'active transportation'—pedestrian, bicycle, and transit improvements.
- *Englewood Forward Light Rail Corridor Next Steps Study (City of Englewood, 2015a)*. Assesses the development potential and evaluated infrastructure alternatives for multimodal connections to the CityCenter and Oxford light rail stations. A pedestrian bridge over the Santa Fe Corridor near the CityCenter station is recommended.

CITY AND COUNTY OF DENVER

Comprehensive Plan 2040

Date Completed	2019
Plan Link	https://citycountydenver-prod.adobecqms.net/content/denvergov/en/community-planning-and-development/planning-and-design/comprehensive-plan-2000.html
Plan Purpose	The plan creates a vision and goals that tie together the City's plans and policies, including <i>Blueprint Denver</i> (City and County of Denver, 2019), which is the City's land use and transportation plan.
Primary Goals	<p>The plan outlines six "vision elements" for the City of Denver. These elements are:</p> <ul style="list-style-type: none"> ➤ Equitable, affordable and inclusive ➤ Strong and authentic neighborhoods ➤ Connected, safe and accessible places ➤ Economically diverse and vibrant ➤ Environmentally resilient ➤ Healthy and active
Vision Pertaining to Santa Fe Drive	<p>The plan outlines neighborhood contexts for properties adjacent to Santa Fe Drive. They include:</p> <ul style="list-style-type: none"> ➤ Urban Center: Near the transit stations, these areas would support a higher density mix of uses within multi-story mixed use buildings. Pedestrian and bicycle use are high with minimal reliance on cars. Good access to high capacity transit. ➤ Urban: The urban context applies to established neighborhoods east of the corridor. These areas are also very walkable/bikeable and have good access to transit with less reliance on cars. ➤ Urban Edge: These neighborhoods are on the southern edge of the corridor in Denver, and tend to be lower density residential and commercial areas, which have a greater reliance on cars than the other areas. ➤ Districts: Industrial areas west of the Santa Fe Drive corridor that have industrial land use and transportation characteristics.

CITY AND COUNTY OF DENVER

Blueprint Denver

Date Completed	2019
Plan Link	https://www.denvergov.org/media/denvergov/cpd/blueprintdenver/Blueprint_Denver.pdf
Plan Purpose	<i>Blueprint Denver</i> is a supplement to the <i>Comprehensive Plan 2040</i> . It sets the framework for the City's major land use and transportation decisions, establishing citywide policies and specific strategies to achieve the vision for an inclusive city in 2040.
Primary Goals	<ul style="list-style-type: none"> ➤ Develop safe high quality mobility options that prioritize walking, biking, and transit ➤ Focus higher-intensity growth in walkable mixed-use centers and along transit priority streets ➤ Serve all residents with a diverse range of affordable housing options and quality employment opportunities ➤ Support a welcoming business environment and support business centers throughout the city
Vision Pertaining to Santa Fe Drive	<p>The plan identifies the following types of "Future Places" along the Santa Fe Drive corridor defined by the scale and type of development envisioned in 2040.</p> <ul style="list-style-type: none"> ➤ Regional Center: The area south of W. Alameda Avenue to W. Mississippi Avenue between Santa Fe Drive and S. Broadway encompassing the transit-oriented developments near the Alameda Station and I-25/Broadway Station has been identified as a future Regional Center with larger-scaled mixed-use buildings and walkable access to passenger rail and transit priority streets. ➤ Innovation/Flex: The area from W. Mississippi Avenue south to W. Mexico Avenue has been identified as an Innovation/Flex district. Innovation/Flex districts are ideal locations for businesses that mix research/design, manufacturing, and logistics. Residential uses including multiunit residential development are compatible with business uses in the area. Building scales vary greatly and are oriented to the street. Streets are also on the standard grid with on-street parking and multimodal access. ➤ Community Center: The area east of Santa Fe Drive to S. Broadway from W. Mexico Avenue to W. Iliff Avenue has been identified as a Community Center with a mix of office, commercial, and residential uses at larger building scales than local centers. Land uses are typically a balance of residential and employment, residential and dining/shopping, or employment and dining/shopping. Buildings are mid-scaled but vary based on the character of the surrounding area and are often oriented to the street or other public spaces.

CITY AND COUNTY OF DENVER

Relevant City and County of Denver Small Area Plans

Several neighborhoods adjacent to the Santa Fe Drive corridor have neighborhood plans, including the *Baker Neighborhood Plan* (City and County of Denver, 2003) and the *Athmar Park Neighborhood Perimeter Plan* (City and County of Denver, 2000). Recommendations from these plans either align with or are superseded by *Blueprint Denver* (City and County of Denver, 2019).

Relevant recent small area plans include:

- *I-25/Broadway Station Area Plan* (City and County of Denver 2016). The plan defines the area's vision as a connected, resilient, and vibrant multimodal hub knitted into the fabric of the city. The plan's conceptual land use framework identifies transit-oriented development residential and office surrounding the station and a town center. Most of the planning area around Broadway Station is identified in *Blueprint Denver* (City and County of Denver, 2019) as a Growth Area and an Urban and Regional Center. This aligns with key recommendations in the station area plan, including incorporating higher densities near the station, encouraging a variety of uses, incorporating high-quality urban design and open space areas, expanding employment opportunities, and promoting environmental sustainability.
- *Alameda Station Area Plan* (City and County of Denver, 2009). The planning area around Alameda Station is identified in *Blueprint Denver* (City and County of Denver, 2019) as a Growth Area and an Urban and Regional Center. The station area plan includes detailed recommendations for land use and urban design, and enhanced mobility, infrastructure improvements, as well as economic, phasing, and implementation strategies. The general station area vision in this plan generally aligns with that in the current blueprint in terms of encouraging larger mixed-use and multiunit residential buildings close to the street and high levels of pedestrian and bicycle use.

2.1.2 Transportation Plans

State, regional, and local transportation plans were reviewed to identify recommendations that could impact future conditions on Santa Fe Drive or should be included in recommendations to be made in the *Santa Fe Drive PEL Study (C-470 to I-25)*. The previous transportation plans inventoried and analyzed in Appendix A are the following:

- *Arapahoe County Transportation Plan* (Arapahoe County, 2010b)
- *Arapahoe County Bicycle and Pedestrian Master Plan* (Arapahoe County, 2017)
- *South Platte Connections Report* (Arapahoe County, 2020a)
- *I-25 Central PEL Study* (CDOT, 2020a)
- *CDOT Express Lanes Master Plan* (CDOT, 2020b)
- *Denver Strategic Transportation Plan* (City and County of Denver, 2008)



- *Denver Moves: Transit Plan* (City and County of Denver, 2019b)
- *Denver Moves: Pedestrians & Trails* (City and County of Denver, 2019d)
- *Neighborhood Transportation Management Program Baker Action Plan* (City and County of Denver, 2020a)
- *Englewood Light Rail Corridor Plan* (City of Englewood, 2013)
- *Light Rail Corridor Next Steps Study* (City of Englewood, 2015a)
- *Englewood Walk and Wheel Master Plan Program* (City of Englewood, 2015b)
- *Envision Littleton Transportation Master Plan* (City of Littleton, 2019b)
- *Santa Fe & Mineral Intersection Study* (City of Littleton, 2019c)
- *Douglas County Transportation Master Plan* (Douglas County, 2019b)
- *Planning and Environmental Linkages (PEL) Report for the Douglas County US 85 Corridor Improvements Study* (CDOT, 2016a)
- *Metro Vision: Our place, our plan* (DRCOG, 2019a)
- *Denver Regional Active Transportation Plan* (DRCOG, 2019b)
- *2040 Metro Vision Regional Transportation Plan* (DRCOG, 2020)
- *RTD Regional Bus Rapid Transit Feasibility Study* (RTD, 2020)
- *First and Last Mile Strategic Plan* (RTD, 2019)

2.2 Review of Existing and Future Land Use

2.2.1 Brief Description of Resource Studied

Current and future land uses provide an understanding of where and what type of growth is forecasted to occur in the Environmental Study Area to more comprehensively plan for future transportation improvements. Jurisdictional comprehensive plans are referenced by DRCOG to inform its development of future year socioeconomic forecasts, which are the primary input to the travel demand model. More information on the socioeconomic forecasts is presented in Chapter 4 *Traffic and Operations*.

2.2.2 Relevant Documents, Studies, Plans

The relevant comprehensive plans listed below are summarized in Section 2.1 *Review of Previous Planning Efforts*. Each plan was reviewed to provide context and understanding of each jurisdiction's vision for the corridor and adjacent lands within the Environmental Study Area.

- DRCOG. *Metro Vision: Our place, our plan* (DRCOG, 2019a)
- City and County of Denver. *Comprehensive Plan 2040* (City and County of Denver, 2019a)

- City and County of Denver. *Blueprint Denver* (City and County of Denver, 2019c)
- Arapahoe County. *Arapahoe County Comprehensive Plan* (Arapahoe County, 2020b)
- City of Englewood. *Englewood Forward Comprehensive Plan* (City of Englewood, 2016)
- City of Sheridan. *Sheridan Comprehensive Plan 2015* (City of Sheridan, 2015)
- City of Littleton. *Envision Littleton Comprehensive Plan* (City of Littleton, 2019a)
- Douglas County. *Comprehensive Master Plan 2040. Vision, Balance, Community* (Douglas County, 2019a)

In some cases, more detailed sub-area or transit-oriented development plans were available. The most relevant plans are summarized in Section 2.1 *Review of Previous Planning Effort*. In many cases, however, these smaller area plans have been incorporated into and superseded by comprehensive plans for the jurisdiction.

2.2.3 Data Collected/Methodology

Assessor's records from each jurisdiction and aerial maps were used to develop the current land use map. It shows the parcels and the land use currently on the property. The future corridor land use map was developed using Geographic Information System (GIS) layers of future land use or comprehensive plan maps from each of the individual jurisdictions. The current land uses and future land uses are shown in Figure 2 through Figure 7.

Because each jurisdiction has its own set of land use categories, categories were simplified and made consistent across the jurisdictions and then checked against comprehensive plan maps. Current and future land uses are summarized according to the following categories:

- Agricultural
- Commercial
- Industrial/Industrial Mixed-Use
- Mixed Use
- Parks/Open Space
- Public/Semi-Public
- Residential

Figure 2. Current Land Uses (1 of 3)

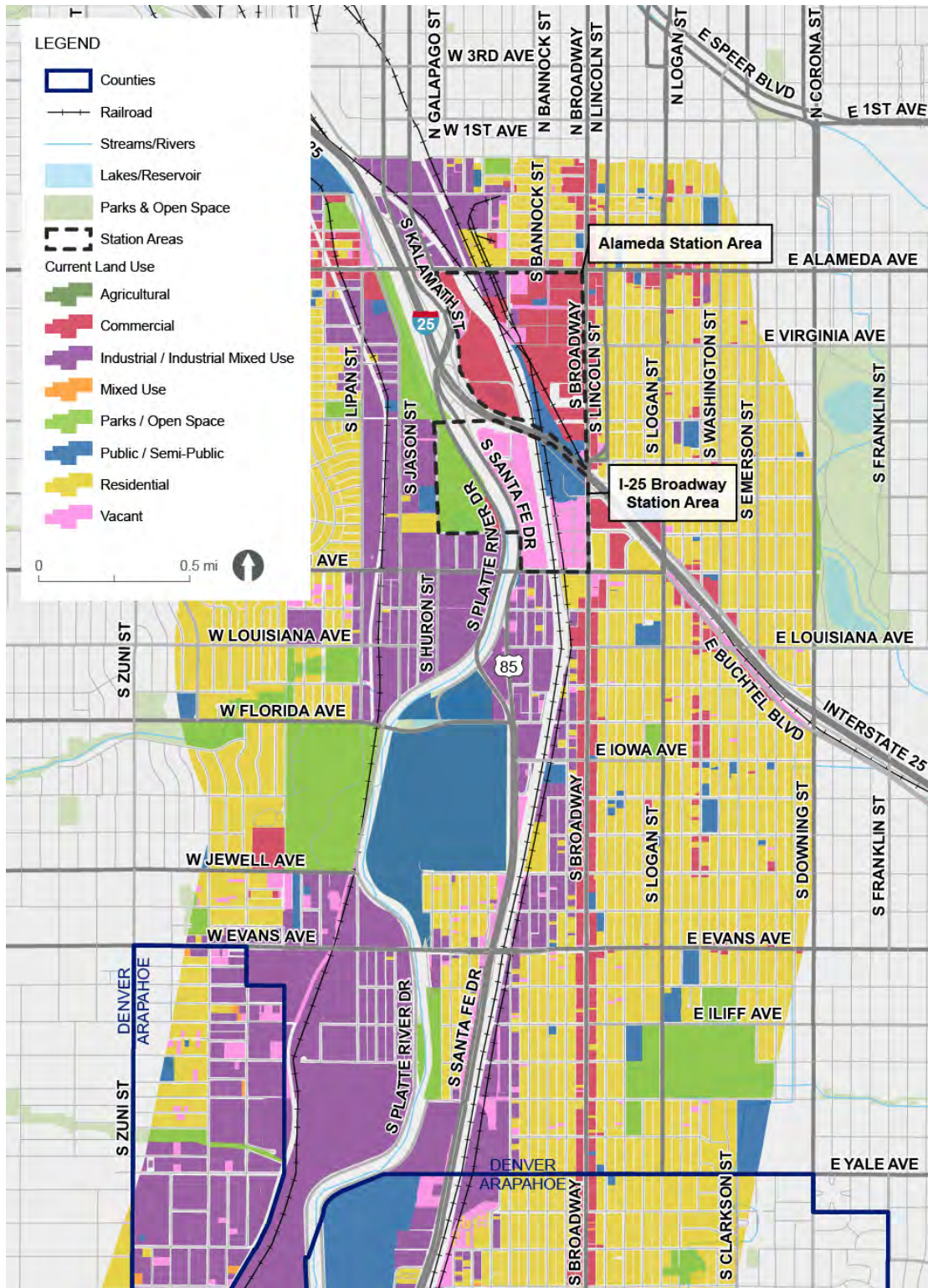


Figure 3. Current Land Uses (2 of 3)

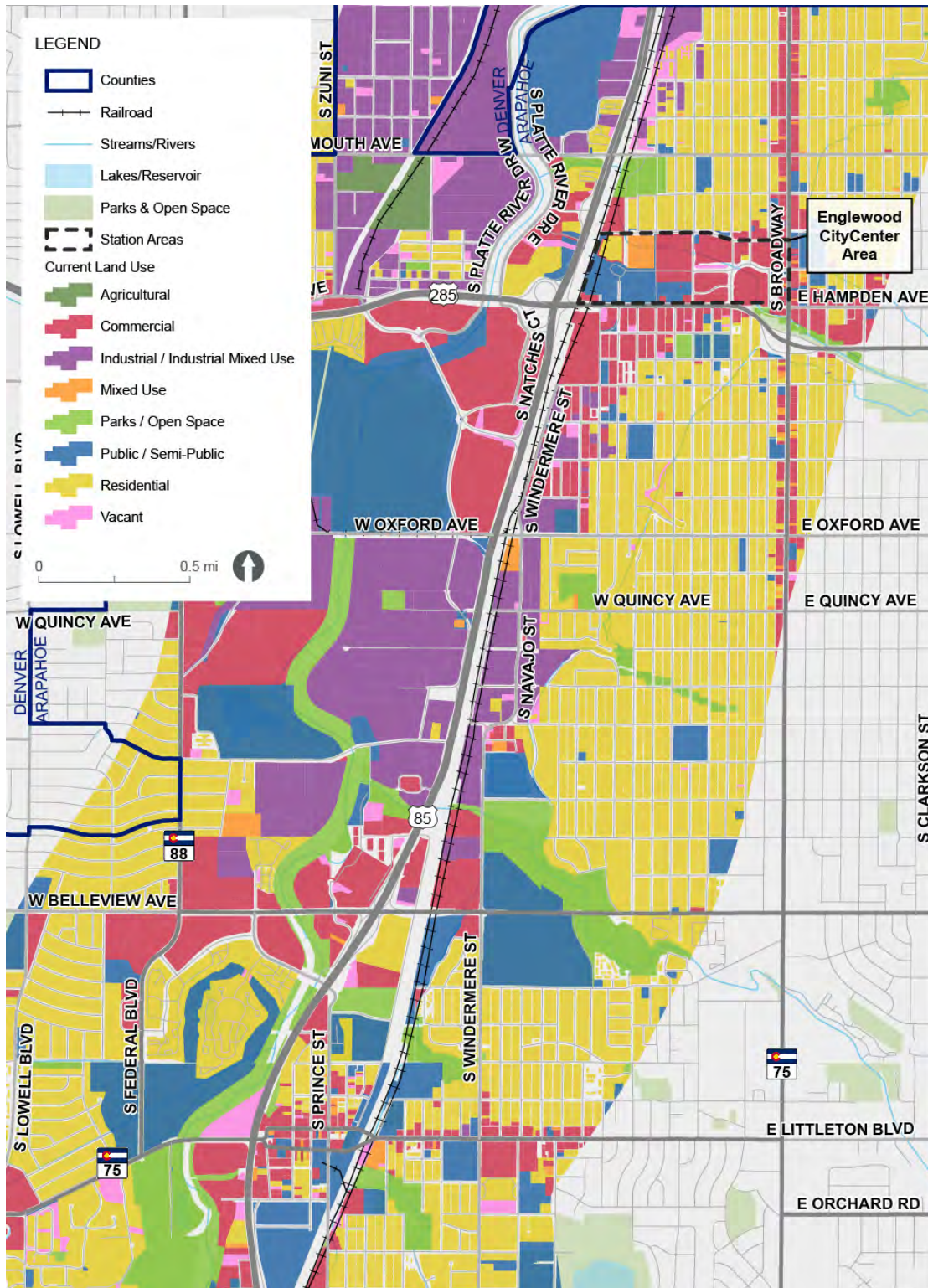


Figure 4. Current Land Uses (3 of 3)

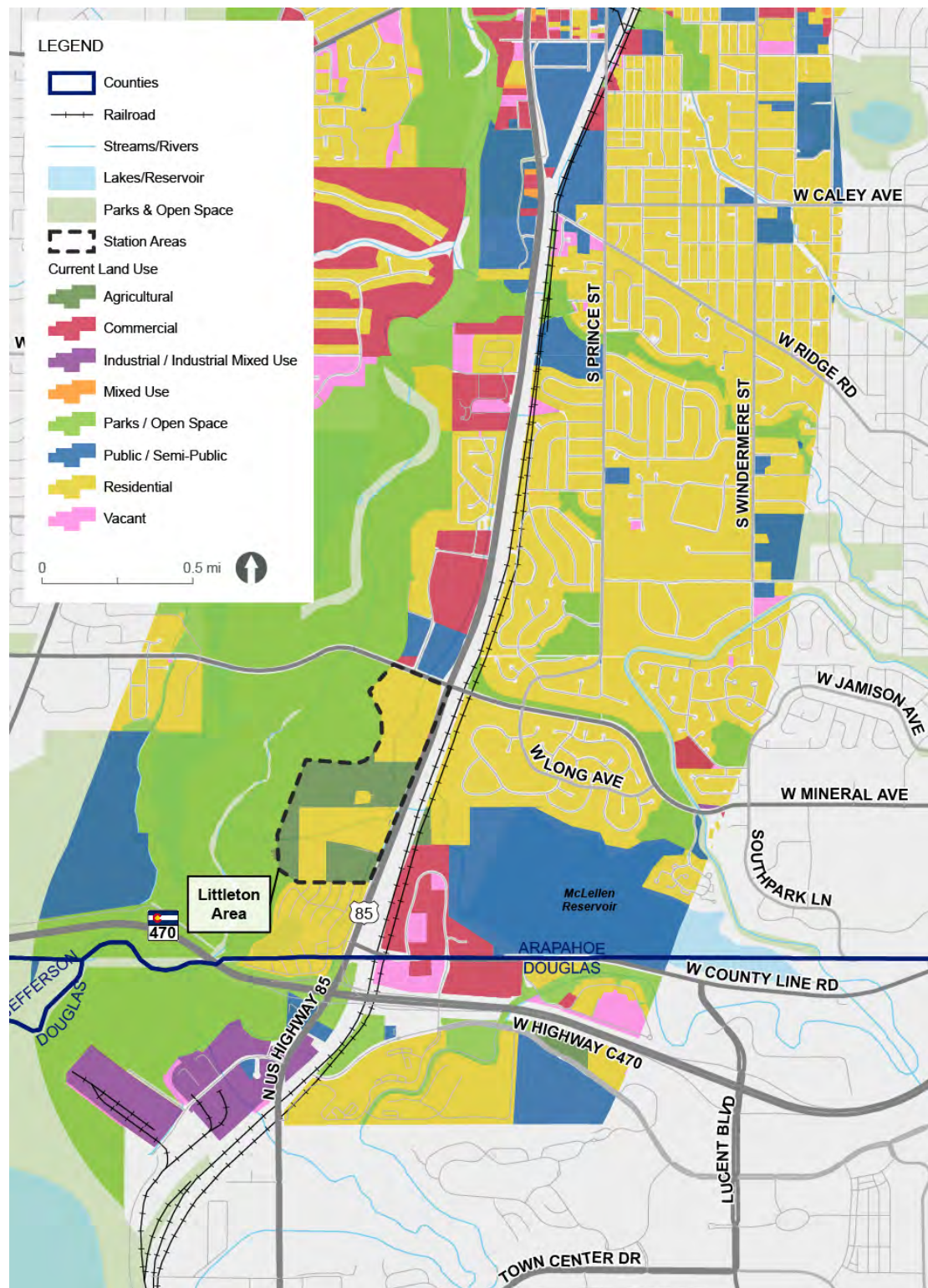


Figure 5. Future Land Uses (1 of 3)

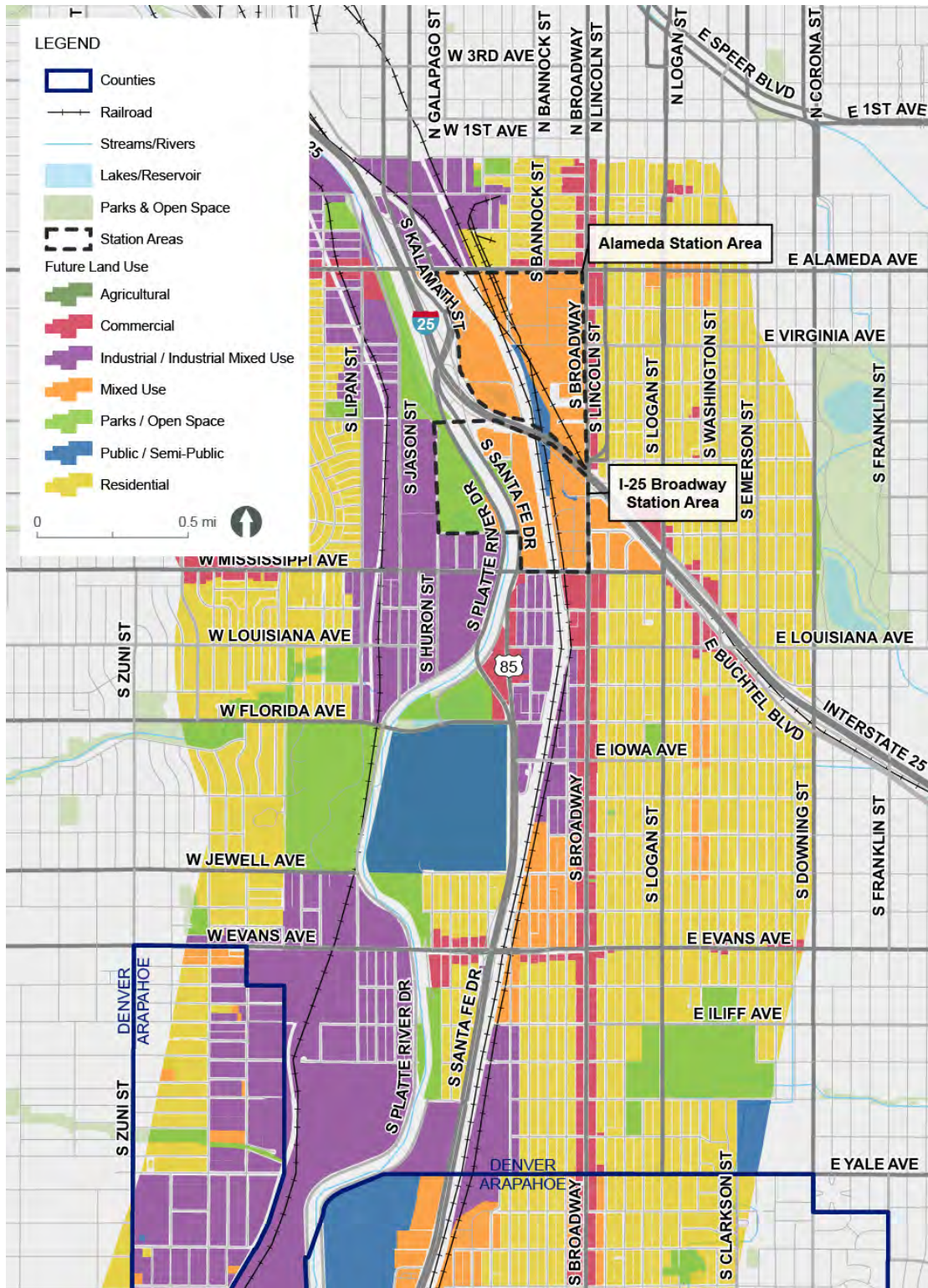


Figure 6. Future Land Uses (2 of 3)

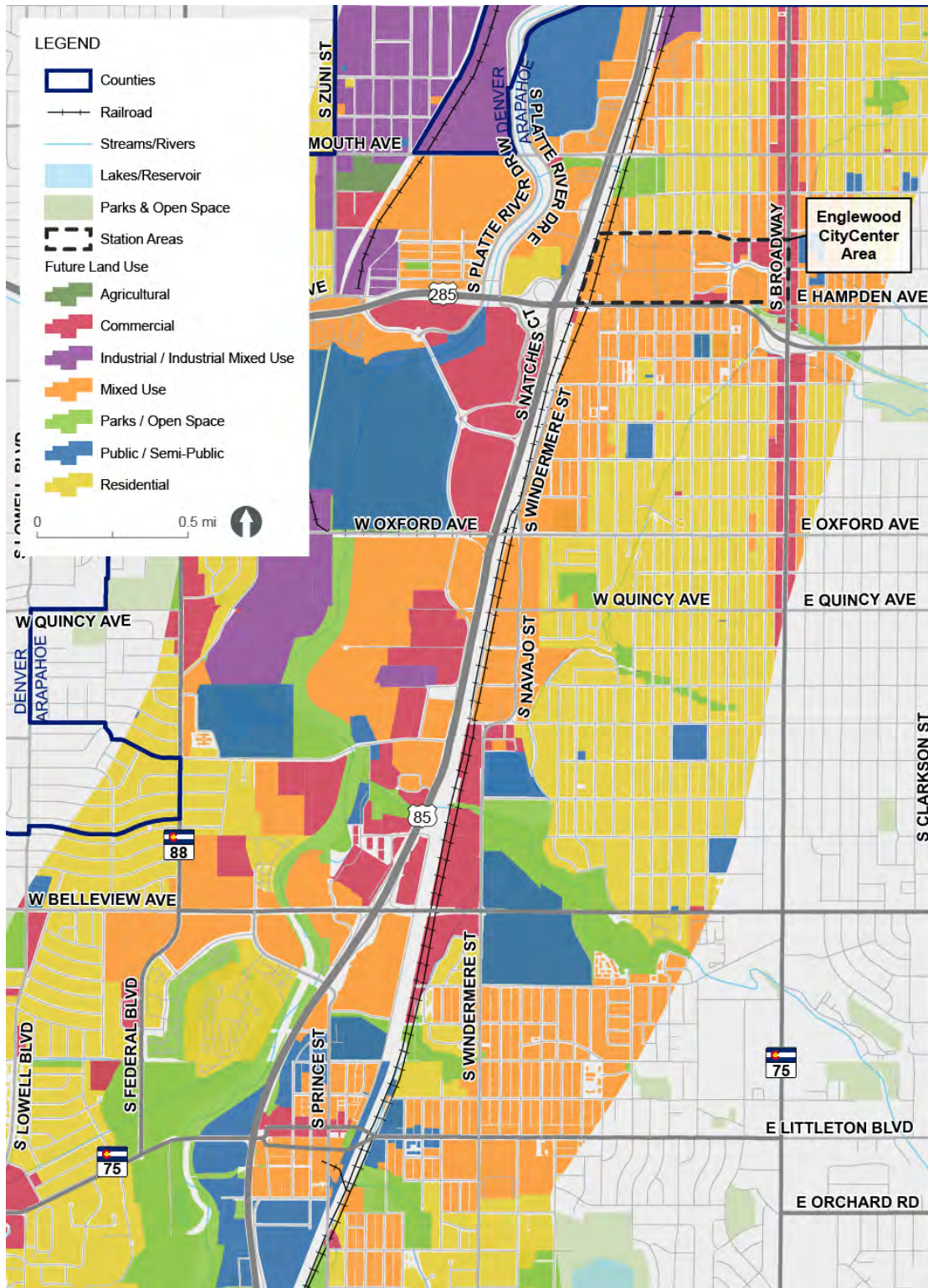
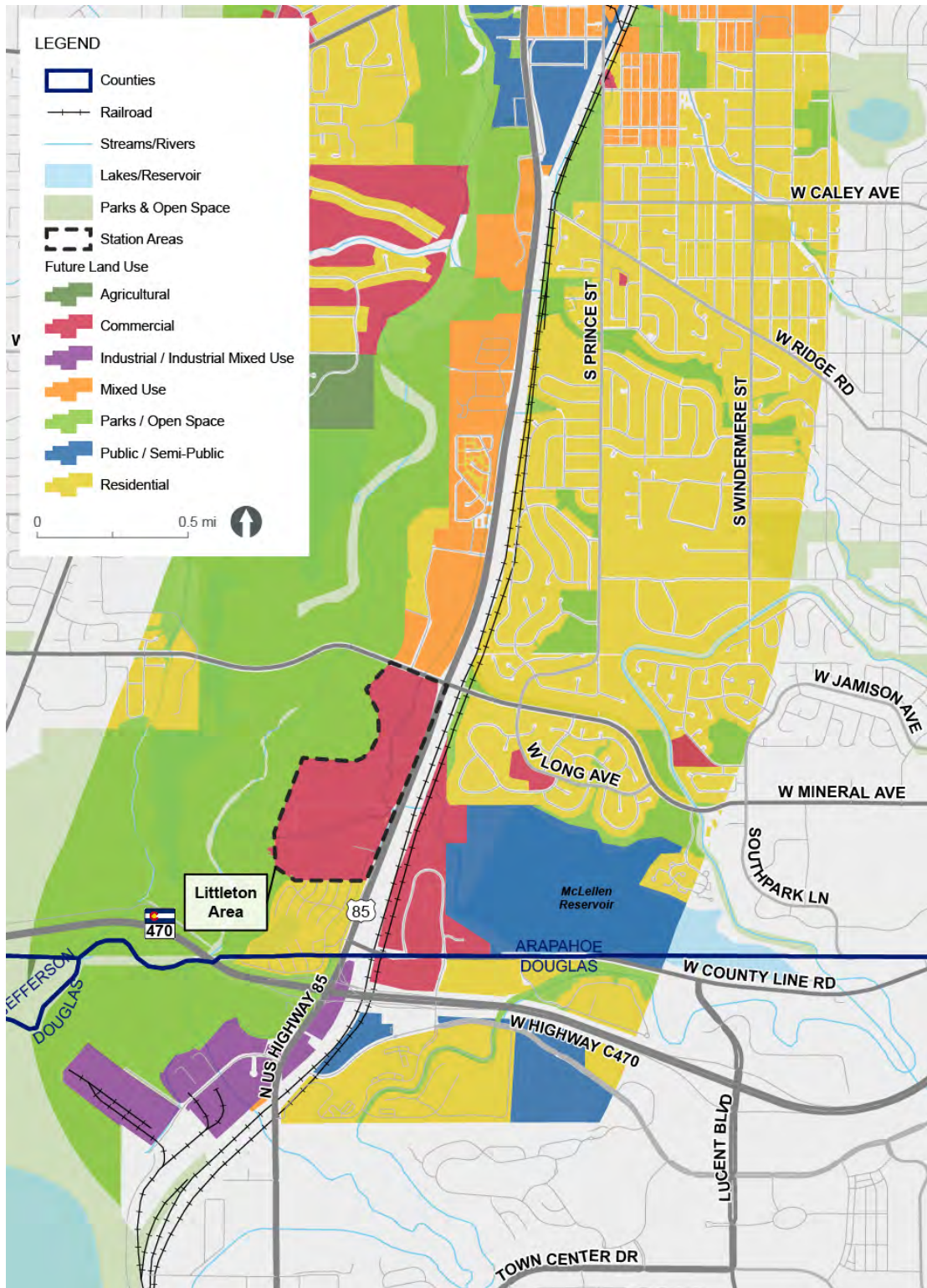


Figure 7. Future Land Uses (3 of 3)



2.3 Findings/Results

The Santa Fe Drive corridor is in the middle of a regional metropolitan area that is continuing to grow. Immediate land uses in the corridor are also transitioning from their formerly industrial uses to mixed-use industrial, commercial, and residential uses at much higher densities than seen previously.

Much of the former industrial lands along Santa Fe Drive are now a mix of industrial and commercial uses. A review of land use plans indicate that land uses are forecasted to continue to transition from primarily industrial and industrial mixed uses in parts of the corridor to a mix of higher-density residential, commercial, and industrial uses oriented towards transit stations and downtowns. Larger future development nodes include the following:

2.3.1 Alameda Station Area

The *Alameda Station Area Plan* (City and County of Denver, 2009) set the framework for high-density, mixed-use development near Alameda Station. Implementation of the plan is underway and established through development guidelines set by the *Denver Design District General Development Plan* (City and County of Denver, 2009), which calls for up to 3,700 residential units and up to 3.8 million square feet of office, retail and hotel space near the station. Initial redevelopment activities included residential multifamily units, commercial development adjacent to the station, and an auto dealership adjacent to Santa Fe Drive. Two large residential apartment complexes are currently being planned and are under construction adjacent to E. Alameda Avenue and just northeast of the station.

2.3.2 Broadway Station Area

Transit-oriented development plans are progressing for the area near the I-25/Broadway Station. The policy framework established by the *I-25/Broadway Station Area Plan* (City and County of Denver, 2016a) is further detailed in the *Infrastructure Master Plan for the Broadway Station Infrastructure Master Plan* (City and County of Denver, 2016b). The more detailed development plans include up to 2,800 residential units, 1.2 million square feet of office space, and 250,000 square feet of retail and restaurant space near the I-25/Broadway Station. The plans intend to reconnect this area to the rest of Denver, add energy to the neighborhood, and make it a convenient location to work, live, and play.

2.3.3 Englewood CityCenter

Redevelopment planning documents for Englewood's CityCenter, which includes Englewood's civic center and the properties between W. Floyd Avenue and W. Hampden Avenue east of Santa Fe Drive extending to Broadway, highlight the desire to make the CityCenter area a vibrant heart of the city that is more attractive and walkable (City of Englewood, 2016). The City of Englewood is currently working with potential private development partners on a plan that would ultimately add up to 950 residential units, as well as a hotel and office space, around a revamped retail plaza festival gathering area to help activate the public area immediately adjacent to the station platform. It is part of the "Downtown Matters" initiative to revitalize

CityCenter, South Broadway, and the commercial areas near the Swedish Medical Center and Craig Hospital to the east in the vicinity of S. Downing Street (City of Englewood, 2020).

2.3.4 Littleton (Santa Fe Drive and C-470) Area

Littleton has a number of smaller-scale developments underway or planned near Santa Fe Drive between W. County Line Road and W. Mineral Avenue. There is a development proposal on Santa Fe Park west of Santa Fe Drive and north of the Littleton Equine Medical Center on approximately 110 acres that is to include 400 to 450 single-family attached townhomes, 350 to 400 multifamily residential units, and 32 acres of open space. The area at the southwest corner of the Santa Fe Drive and W. Mineral Avenue intersection is proposed for either commercial development or a school with some multifamily residential (City of Littleton, 2020).

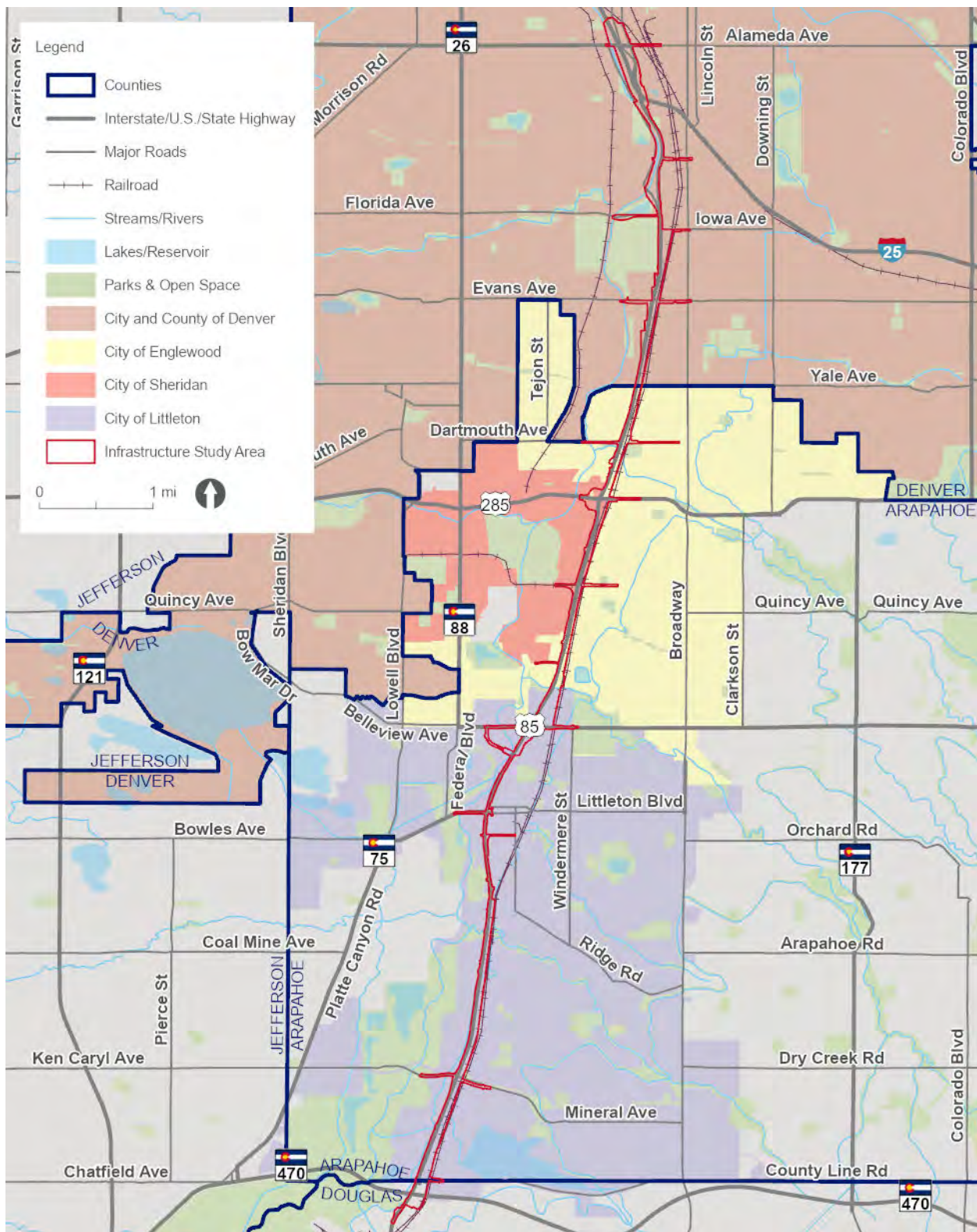
3. Corridor Context

This segment of Santa Fe Drive is an important regional transportation corridor between downtown Denver and Douglas County, as well as for the other communities located along or served by this corridor. The corridor is an important connection for interregional travel and a route for commuter and local trips for residents and businesses in the growing area communities. The 11-mile highway corridor has a functional classification of Principal Arterial for the entire length of the study area with an access category of Expressway from C-470 to W. Florida Avenue and Non-Rural Principal Highway north of W. Florida Avenue. It varies in cross-section, surrounding character, and use, which creates differing issues for travelers that utilize some or all of the various sections of this regional travel corridor. This section discusses the characteristics of the major infrastructure elements being evaluated as part of the *Santa Fe PEL Study (C-470 to I-25)*, including roadway infrastructure, transit services, bicycle facilities, pedestrian facilities, and freight railroad facilities. The discussion focuses on the current conditions of these elements and how the elements are operating.

3.1 Roadway Characteristics

The overall geometric conditions of Santa Fe Drive between C-470 and I-25 are highly variable and demonstrate a mix of previous strategies to increase safety, provide and manage access, and accommodate demand. Unless otherwise specified within this chapter, the corridor context was evaluated within the limits of the Infrastructure Study Area shown in Figure 8. In general, the Infrastructure Study Area covers the Santa Fe Drive right-of-way, as well as the public right-of-way of the cross streets up to approximately one intersection east and west of Santa Fe Drive.

Figure 8. Infrastructure Study Area



3.1.1.1 Highway Designation and Functional Classification

Between C-470 and I-25 (approximately mileposts [MP] 200.1 to 210.8), Santa Fe Drive is within the segment of highway denoted as US 85B in CDOT's highway system. Just north of I-25, the corridor transitions to no longer be a part of CDOT's highway system.

South of C-470, Santa Fe Drive has a functional classification of Principal Arterial (Other). North of C-470, Santa Fe Drive is classified as a Principal Arterial (Freeway and Expressway).

3.1.1.2 Speed Limit

The posted speed limit along the corridor varies between 35 miles per hour (mph) and 55 mph. Posted speeds along the corridor are shown in Figure 9.

3.1.1.3 Horizontal Alignment

The mainline Santa Fe Drive alignment generally meets requirements for minimum radii for horizontal alignment in relation to the corresponding design speed at each curve location. No deficiencies were noted that would require substantial horizontal geometric revisions. When Santa Fe Drive is not congested, running speeds are typically higher than the posted speed limit, particularly between Dartmouth Avenue and Iowa Avenue.

3.1.1.4 Existing Pavement

The Santa Fe Drive corridor has hot mix asphalt surfacing from W. Blakeland Drive to just south of W. Crestline Avenue and then again from W. Florida Avenue north through the W. Alameda Avenue intersection. Between W. Crestline Avenue and W. Florida Avenue, the corridor has Portland cement concrete pavement. Through the Infrastructure Study Area, some of the cross streets are paved in hot mix asphalt and some are paved in Portland cement concrete pavement.

3.1.2 Typical Cross Sections

Generally, the Santa Fe Drive corridor has four roadway typical cross-sections (exclusive of turn lanes and auxiliary lanes) shown in Figure 10:

- Four-lane section: From the south end of the corridor through the W. Bowles Avenue intersection, Santa Fe Drive has two 12-foot through lanes in each direction. The outside shoulders generally drain to roadside ditches (with the exception of some sporadic stretches of curb along Arapahoe Community College, Aspen Grove, and other developed properties between W. Bowles Avenue and W. Mineral Avenue).
- Six-lane section: From the north side of the W. Bowles Avenue intersection through the W. Evans Avenue interchange, Santa Fe Drive has two 12-foot through lanes in each direction, as well as one 12-foot express lane in each direction. This express lane is limited to vehicles with two or more persons in the northbound direction on weekday mornings (6:00 a.m. to 8:30 a.m.) and in the southbound direction on weekday evenings (4:00 p.m. to 6:30 p.m.) and serves as an additional general purpose lane at all other times. There is curb and gutter along the outside shoulders.

Figure 9. Posted Speed Limits

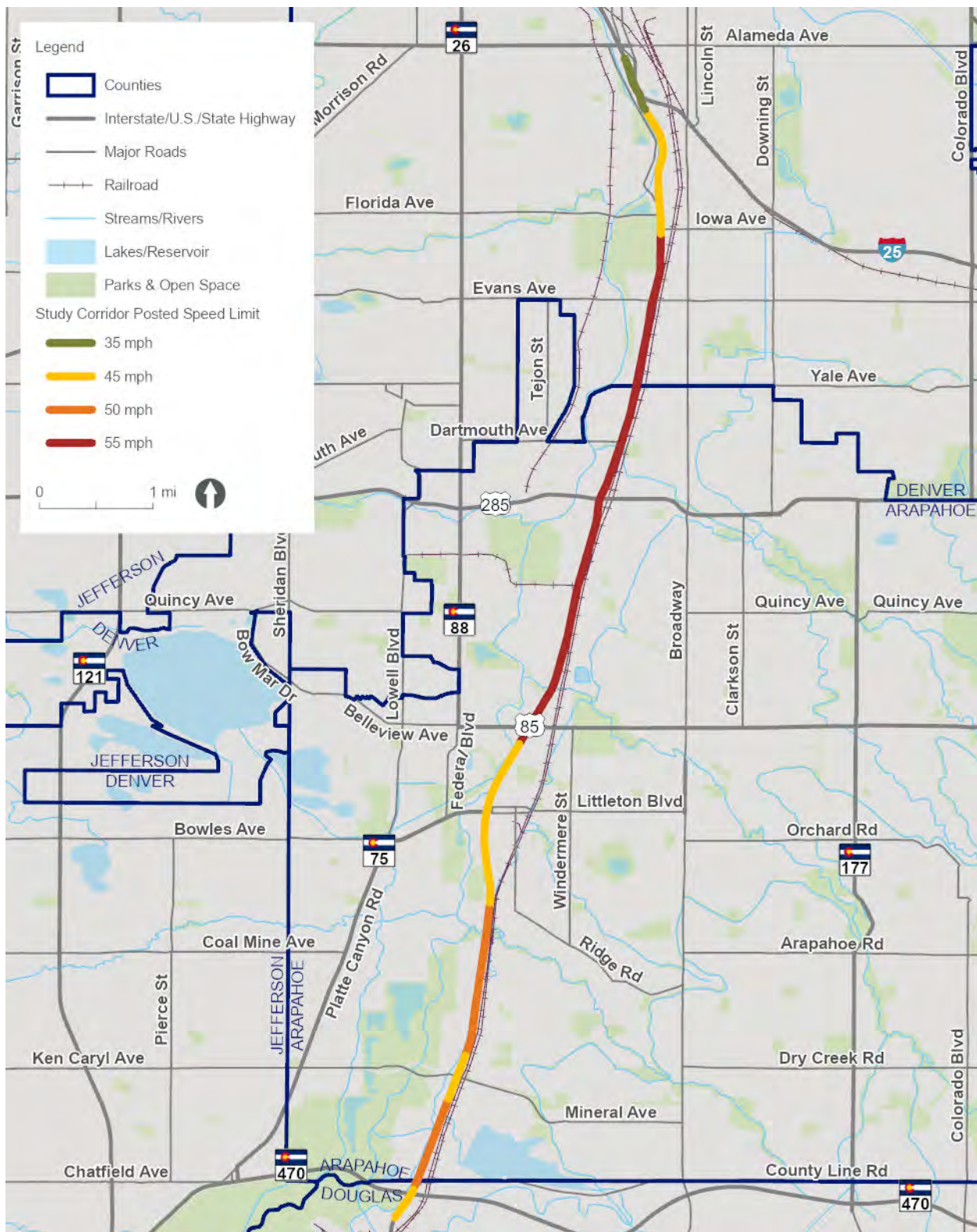
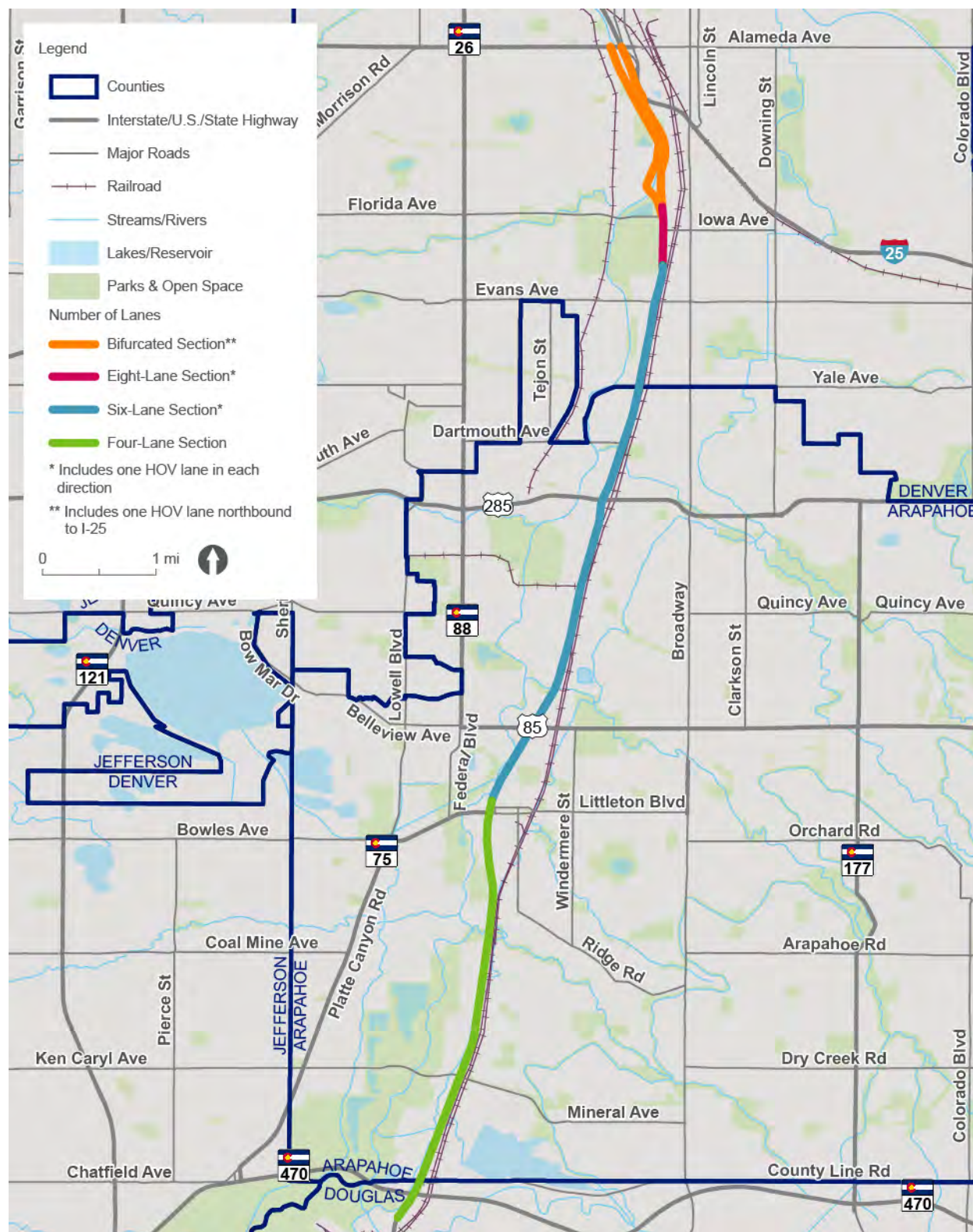


Figure 10. Number of Lanes



In the southbound direction, recent improvements restriped the auxiliary lanes and shoulders to provide three through lanes from north of Dartmouth Avenue, through the Dartmouth Avenue signal, to the Hampden Avenue interchange, with the additional lane dropped at the Hampden Avenue/northbound US 285 off ramp.

- Eight-lane section: From the W. Evans Avenue interchange to the W. Florida Avenue intersection, Santa Fe Drive has three 12-foot through lanes and the express lane (subject to the description above) in each direction with curb and gutter.
- Bifurcated: From W. Florida Avenue north through W. Alameda Avenue, Santa Fe Drive is bifurcated by development and the South Platte River and generally has between two and three 12-foot through lanes in each direction with curb and gutter.
 - The northbound section includes three general purpose lanes and an express lane which continues to I-25.
 - The southbound section generally includes four general purpose lanes south of the merge point with the I-25 ramp to Mississippi Avenue. South of Mississippi Avenue, the section includes three general purpose lanes. The southbound express lane starts north of Florida Avenue.
 - The specific number of lanes varies significantly through this section due to movements related to the I-25 interchange ramps, auxiliary lanes, and intersection and access configurations.

3.1.2.1 Turn Lanes

Turn lanes and other auxiliary lanes along the corridor were observed to vary slightly, but most turn lanes maintain 11 feet or more of width. Specific locations with turn lanes on Santa Fe Drive with less than 11 feet of width (based on measurements from Google Earth catalogued in July 2020) include:

- Northbound left turn lane to W. Blakeland Drive.
- Northbound interior left turn lane to westbound C-470.
- Northbound left turn lane to S. Vinewood Street.
- Southbound left turn lane to S. Sumner Street.
- Northbound interior left turn lane to W. Bowles Avenue.
- Southbound right turn lane to S. Prince Street.
- Southbound right turn lane to S. Lipan Street.
- Northbound right turn to S. Cherokee Street.
- Northbound left turn to W. Florida Avenue.

Turn lane widths on the cross streets were not measured and catalogued for this report but will be considered for improvement if found to be substandard during the alternatives phase of this study.

Turn lane configurations at corridor intersections vary; some have single left turn lanes and others have double left turn lanes. Proposed turn lane configurations will be explored during design processes in conjunction with operational analyses.

3.1.2.2 Medians

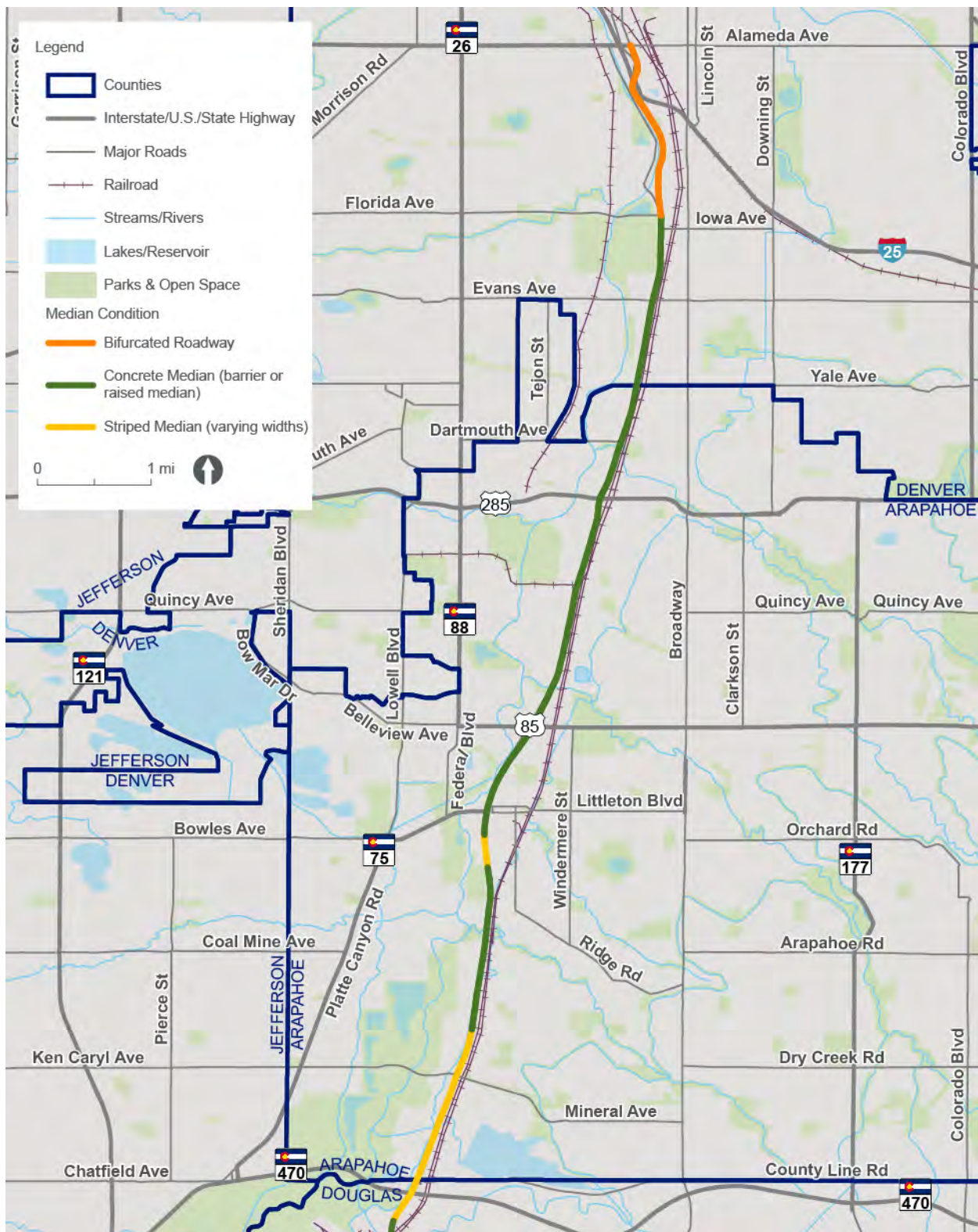
The Santa Fe Drive corridor has varying median conditions (Figure 11):

- Double-yellow centerline stripe with no median.
- Striped median (varying widths).
- Concrete barrier with varying inside shoulder widths.
- Raised concrete median (with and without planters).

The City of Englewood is currently exploring modifications to the raised median through its jurisdictional boundaries, north and south of the W. Hampden Avenue interchange. Additional consideration for consistency of median treatments and provision or exclusion of access through medians will be explored during the alternatives development phase of this study.

Outside of the roadway shoulders, the corridor has stretches of intermittent guardrail or barrier, noise or retaining walls, and fencing. These elements either delineate between CDOT right-of-way and private property or protect errant vehicles from leaving the road. Where the railroad and/or light rail parallels the roadway corridor, chain-link fencing separates the railroad/transit right-of-way from CDOT right-of-way.

Figure 11. Median Conditions



3.1.3 Right-of-Way

Existing public right-of-way widths along the Santa Fe Drive corridor vary considerably. At intersections and interchanges, the right-of-way widens to accommodate the expanded space required for turn and/or auxiliary lanes. As the study progresses into alternatives and concept design efforts, additional investigation will be required, particularly in places where preliminary ownership records searches indicate overlap of individual parcels into the perceived public right-of-way for the corridor.

3.1.3.1 Public and Railroad Right-of-Way Interactions

A desktop review of public property records and parcel boundaries in GIS indicates lack of clear delineation between highway and railroad right-of-way in some locations along the corridor:

- From W. Mineral Avenue north to approximately W. Ridge Road, publicly available data does not clearly identify ownership along parcels on the east side of Santa Fe Drive parallel to Santa Fe Drive and the railroad tracks. Additional research into CDOT or other property records will be appropriate, depending on alternatives selected for consideration in this area.
- From W. Belleview Avenue north to an area just south of the interchange at W. Hampden Avenue, property ownership information is also unavailable via publicly available data. The railroad right-of-way appears to overlay portions of existing Santa Fe Drive. Additional property research may be warranted here, depending on alternatives selected for consideration in this area.
- Between W. Dartmouth Avenue and W. Evans Avenue, portions of Santa Fe Drive may be in railroad right-of-way, and other portions of the railroad may be in CDOT right-of-way.

At the rail spur at W. Oxford Avenue, public records research shows that the spur track runs approximately 20 feet south of the edge of pavement in public right-of-way.

Depending on the alternatives selected for more detailed evaluation as a part of this study, the proximity of the railroad could present a significant physical restriction. The project team may benefit from additional records research related to the specific boundary location between CDOT and railroad properties in all areas where the railroad is directly adjacent to the east side of Santa Fe Drive.

3.1.4 Roadway Lighting

There is roadway lighting via streetlights the full length of the Santa Fe Drive corridor. The style of streetlight pole and fixture vary, and the streetlight pole placement varies from the median to the outside edge along the corridor. Varying lighting implementation programs have also resulted in a variance between HPS (high-pressure sodium) and LED (light-emitting diode) light fixtures along the corridor. These varying fixture types generate inconsistent light levels along the corridor.

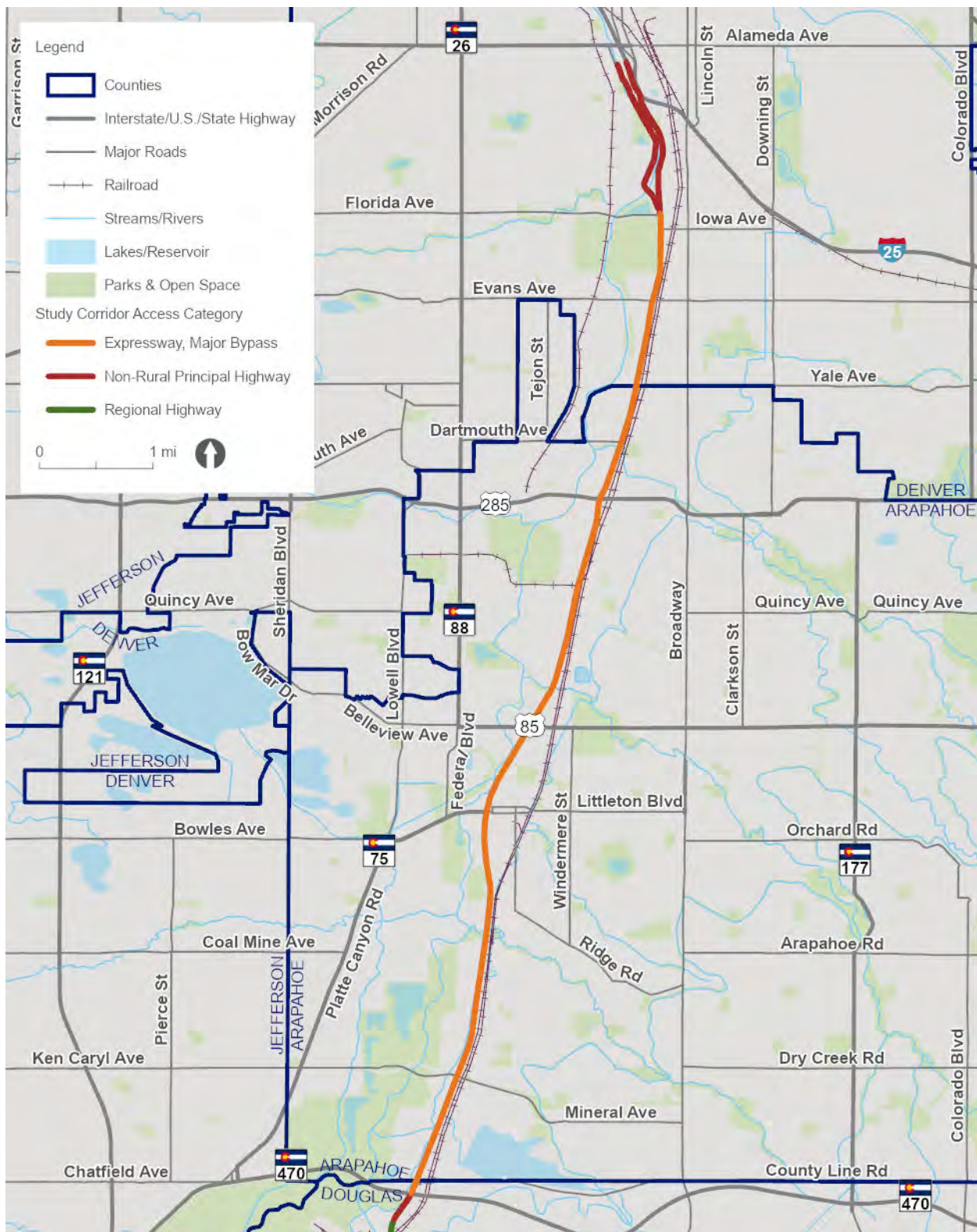
3.1.5 Access Categories

CDOT assigns access categories to state highways that define specific roadway functions and access characteristics for a roadway segment. The categories are associated with certain requirements for access spacing and auxiliary lanes, as documented in the *Colorado State Highway Access Code* (State of Colorado, 2002).

The current access categories for the Santa Fe Drive corridor are illustrated in Figure 12. South of the Infrastructure Study Area, Santa Fe Drive is classified as Regional Highway. From the southern end of the Infrastructure Study Area to C-470, the corridor is classified as Non-Rural Principal Highway. For the majority of the corridor, from C-470 to W. Florida Avenue, Santa Fe Drive is classified as Expressway, Major Bypass. At the northern end of the corridor, from north of W. Florida Avenue to the end of the state highway north of I-25, the corridor is again classified as Non-Rural Principal Highway. The access categories along the Santa Fe Drive corridor are defined below, as described in the *Colorado State Highway Access Code* (State of Colorado, 2002).

- **Non-Rural Principal Highway:** This category is appropriate for use on highways that have the capacity for medium to high speeds and provide for medium to high traffic volumes over medium and long distances. They provide for interregional, intraregional, intercity, and intracity travel needs in suburban and urban areas. Direct access service to abutting land is subordinate to providing service to through traffic movements.
- **Expressway, Major Bypass:** This category is appropriate for use on highways that have the capacity for high speed and relatively high traffic volumes. They provide for interstate, interregional, intraregional, and intercity travel needs and to a lesser degree, some intracity travel needs. Direct access service to abutting land use is subordinate to providing service to through traffic movements.
- Individual private driveways and business accesses on Santa Fe Drive between C-470 and W. Florida Avenue are inconsistent with the corridor access category classification of Expressway and negatively impact corridor travel and operations with turning conflicts and speed differentials. The highway also does not meet the required spacing of one mile between public road intersections in some segments. The lack of a local roadway network for property access contributes to the high number of private driveways and business accesses on Santa Fe Drive, particularly in Littleton south of W. Bowles Avenue, as well as on the west side of the corridor south of W. Union Avenue and north of W. Dartmouth Avenue in Englewood.

Figure 12. Access Categories



3.1.6 Intersecting Street Accesses

Cross streets intersecting Santa Fe Drive (Table 1) connect through a varying mix of full-movement intersections, limited-movement intersections, and interchanges.

Table 1. Public Street Intersection Controls

Intersecting Public Street	Intersection Control
W. Blakeland Drive	Traffic Signal
C-470	Interchange
W. County Line Road	Traffic Signal
W. Mineral Avenue	Traffic Signal
Aspen Grove Way	Traffic Signal (3-leg to west)
Brewery Lane	Traffic Signal (3-leg to west)
W. Weaver Avenue	Right-In/Right-Out (southbound)
S. Vinewood Street/S. Sumner Street	Traffic Signal
W. Maplewood Avenue	Unsignalized
W. Lake Avenue	Unsignalized
Church Avenue	Traffic Signal
W. Bowles Avenue/Littleton Boulevard	Traffic Signal
W. Crestline Avenue	Three-Quarter Movement (no westbound left turn)
S. Prince Street	Traffic Signal
W. Belleview Avenue	Interchange
W. Chenango Avenue/W. Rio Grande Street	Opposing Three-Quarter Movements (no eastbound or westbound left turns)
S. Santa Fe Circle	Right-In/Right-Out (southbound)
W. Union Avenue	Traffic Signal (3-leg to west)
W. Quincy Avenue	Right-In/Right-Out (southbound)
W. Oxford Avenue	Traffic Signal
W. Hampden Avenue / US 285	Interchange (with signals on Santa Fe Drive)
Rob Roy Street	Right-In/Right-Out (southbound)
W. Dartmouth Avenue	Traffic Signal
S. Lipan Street	Right-In/Right-Out (southbound)
W. Harvard Avenue	Right-In/Right-Out (southbound)
W. Evans Avenue	Interchange
W. Jewell Avenue	Right-In/Right-Out (southbound)
S. Cherokee Street	Right-In/Right-Out (northbound)
W. Iowa Avenue	Traffic Signal (3-leg to east)
W. Florida Avenue	Traffic Signal
W. Arkansas Avenue	Right-In/Right-Out (northbound)
W. Louisiana Avenue	Right-In/Right-Out (northbound)
Platte River Drive	Right-In (southbound)
W. Arizona Avenue	Right-In/Right-Out (northbound)
W. Mississippi Avenue	Traffic Signal (Bifurcated)
W. Tennessee Avenue	Right-In/Right-Out (southbound)
I-25	Interchange
Unnamed Intersection	Traffic Signal (3-leg to east)
W. Alameda Avenue	Traffic Signal (Bifurcated)

3.2 Structures

A listing of major bridge and culvert structures and substantial wall structures was compiled from information available on the CDOT Staff Bridge database. There are more than 65 major structures along Santa Fe Drive within the Infrastructure Study Area, shown in Figure 13. The structures are tabulated in Appendix B with details on the year built, structure type, sufficiency rating, and considerations for potential repairs. Reasons for bridge and structural repair or replacement include:

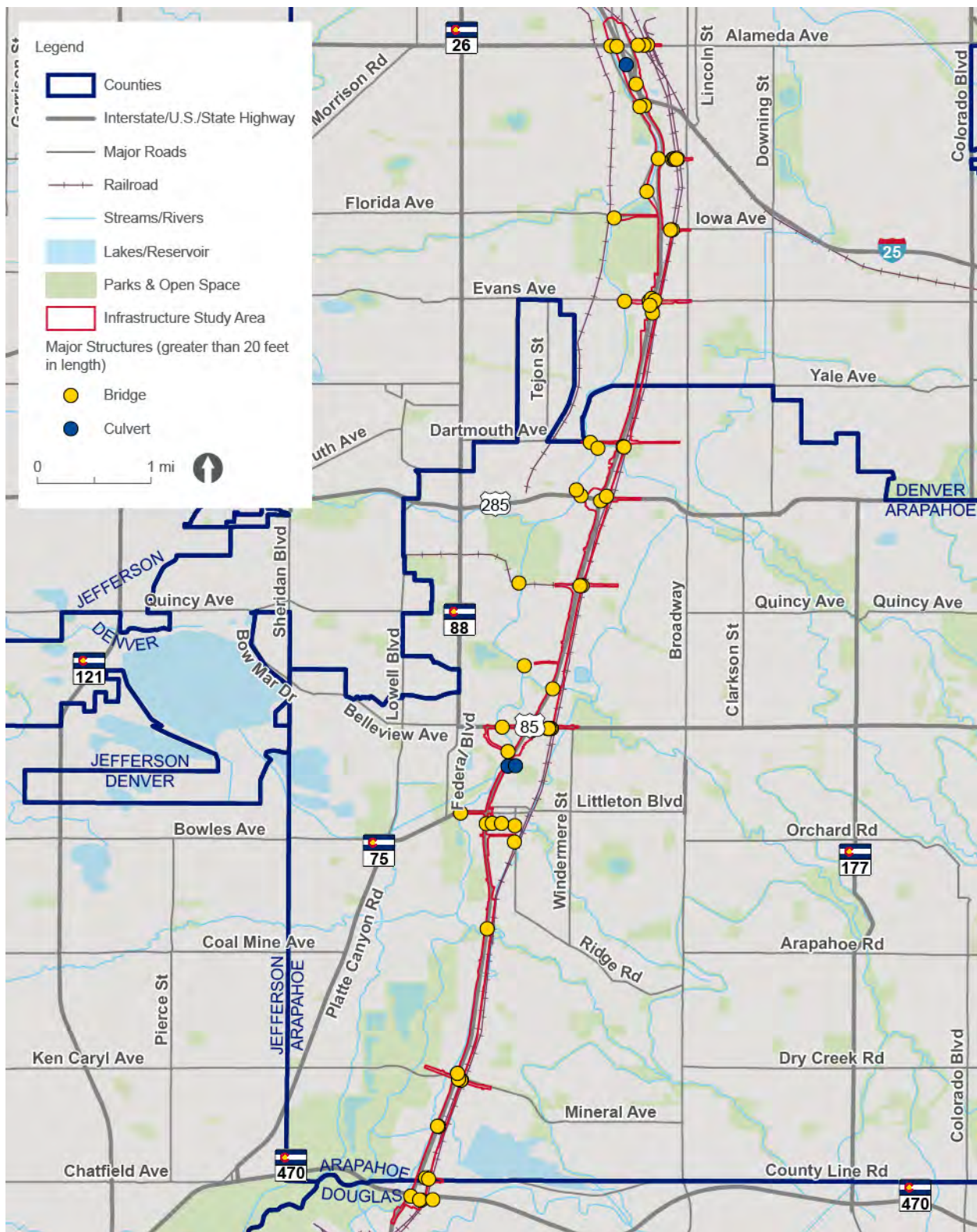
- **Functional Status.** CDOT classifies each structure on its system based on recurring inspection reports. Structures that have been classified as “Functionally Obsolete” or “Structurally Deficient” along the Santa Fe Drive corridor within and very near to the Infrastructure Study Area were identified.
- **Load Rating.** To allow the passage of oversized loads, CDOT inspectors evaluate the ability of each roadway structure to carry loads that require permitted passage along highways.
- **Potential Minor Repairs.** Each structure’s inspection report was analyzed, and certain components of some structures were identified as potentially needing minor repairs within the next 15 years.

Most of the structures that are identified in Appendix B have sufficiency ratings that would not warrant structure replacement solely due to structural concerns. However, many structures are identified that show that replacement can be recommended based on functional status.

Individual bridges will be evaluated for the ability to widen during the concept design for improvement alternatives.

More than 100 walls were identified. The majority of the walls support the existing bridge structures; the remaining walls serve as various retaining and noise walls along the corridor. The wall condition data will be evaluated as appropriate during the alternatives analysis phase of the study.

Figure 13. Major Structures



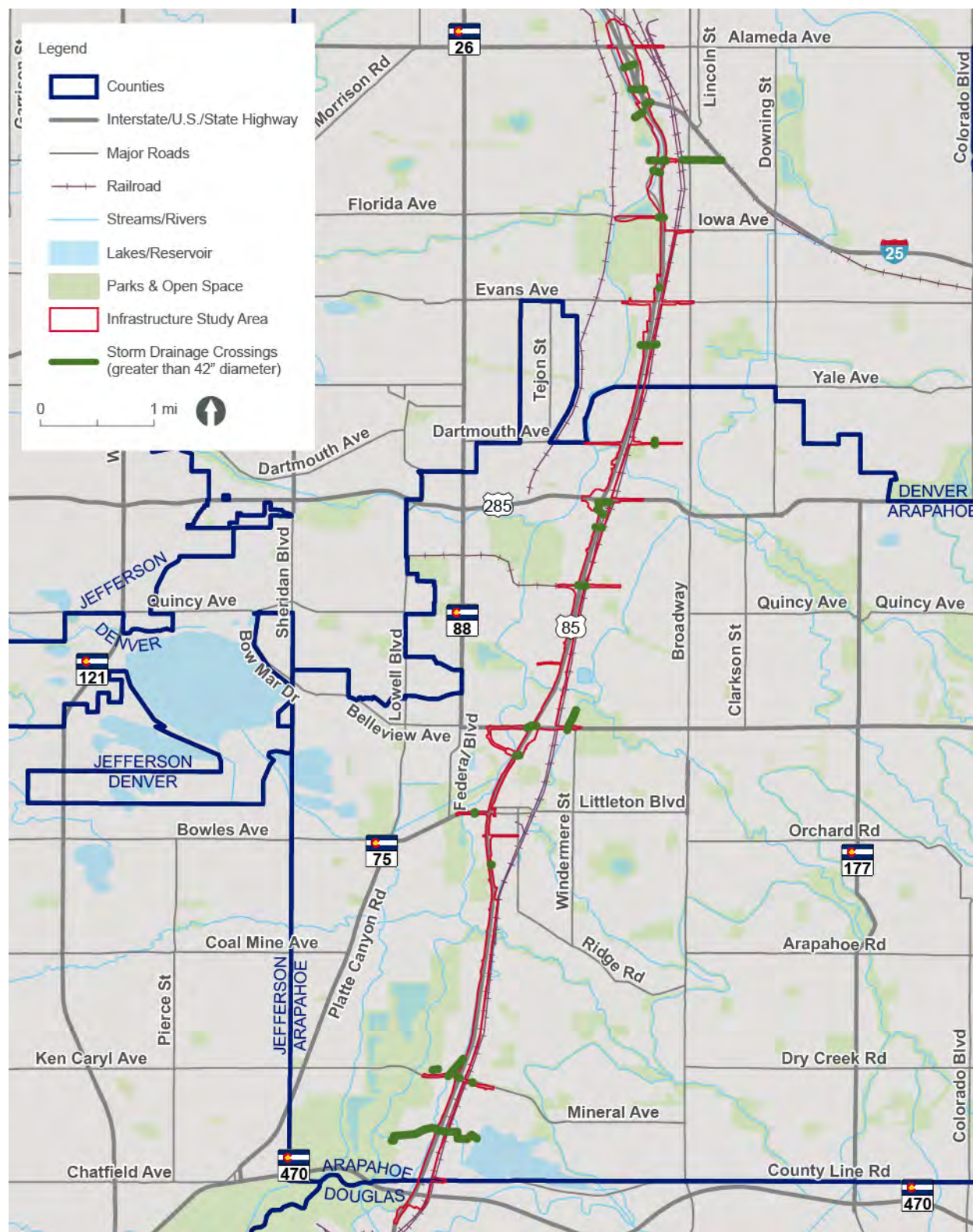
3.3 Hydraulics and Hydrology

Runoff in the Santa Fe Drive corridor generally flows east to west to drain into the South Platte River, which runs parallel to the corridor at or just beyond the western boundary of the Infrastructure Study Area. This portion of Santa Fe Drive also crosses several named tributaries: Sanderson Gulch, Harvard Gulch, Little Dry Creek, Big Dry Creek, Slaughterhouse Gulch, Little's Creek, Lee Gulch, Rangeview Gulch, Jackass Gulch, and Dad Clark Gulch. There are 13 major bridges or culverts passing flow from these and other unnamed drainages across roadways in the Infrastructure Study Area, and there are 14 major bridges across the South Platte River along or adjacent to the corridor. Major structures are described in the Structures section of this report and those carrying roadways over waterways are listed in Appendix C.

The corridor passes through the City and County of Denver storm drainage basins 5000-01 West Washington Park, 0064-02 Valverde, 5000-03 University & Mexico South, and 5200-01 Harvard Gulch Lower Basin. Within the City of Englewood, Santa Fe Drive crosses the Northern, Central, and Southern Englewood Basins. All basins drain east to west into the South Platte River with the exception of 0064-02 Valverde, which is situated on the west side of the river and drains to the east. Existing and proposed storm drainage facilities greater than 42 inches in diameter crossing Santa Fe Drive or other streets in the study area are catalogued in Appendix D and are shown in Figure 14.

The only known major pending improvement to storm drainage facilities along or crossing Santa Fe Drive will occur within the Cities of Englewood and Sheridan, crossing Santa Fe Drive south of W. Oxford Avenue. As of September 2020, the City of Englewood is soliciting proposals for this work from design firms. The work is proposed to go to construction in late 2021 and is intended to alleviate recent flooding and sinkhole issues at W. Oxford Avenue.

Figure 14. Corridor Storm Drainage Crossings



3.4 Utilities

Utilities in the Santa Fe Drive Infrastructure Study Area include communications, electric, gas, irrigation, water, sanitary sewer, and storm sewer facilities. This report focuses on the utility owners that have facilities in the Infrastructure Study Area and identifies major utility infrastructure that is critical for service or distribution or that could be costly or complicated to relocate.

3.4.1 Utility Owners

Accommodation of utilities in public right-of-way is managed by federal, state, and local access codes and permitting processes. CDOT manages utility access along Santa Fe Drive consistent with 2 CCR 601-18 State Highway Utility Accommodation Code. The City and County of Denver, City of Englewood, City of Sheridan, and City of Littleton manage utility access within their right-of-way consistent with their local codes. Utility owners along the corridor are listed in Table 2.

Table 2. Utility Company, Type, and Facilities

Utility Company	Utility Type	Minor Utilities	Major Utilities ¹
Arapahoe Community College	Communications	Yes	Unknown
Arapahoe County IT	Communications	Yes	Unknown
Black & Veatch	Communications	Yes	Unknown
CDOT Intelligent Transportation System	Communications	No	Yes
CDOT Region 1 (traffic)	Communications	Yes	No
Centennial Water and Sanitation District	Sanitary Sewer	Yes	No
Centennial Water and Sanitation District	Water	Yes	No
CenturyLink	Communications	Yes	No
City of Englewood	Sanitary Sewer	Yes	Yes
City of Englewood	Storm Sewer	Yes	Yes
City of Englewood	Water	Yes	Yes
City of Englewood (traffic)	Communications	Yes	No
City of Littleton	Storm Sewer/Sanitary Sewer	Yes	Yes
Comcast	Communications	Yes	Unknown
Denver Parks & Recreation	Irrigation	Yes	No
Denver Department of Transportation & Infrastructure	Communications	Yes	No
Denver Wastewater Management Division	Storm Sewer	Yes	Yes
Denver Water	Water	Yes	Yes
Englewood Sanitary #1	Sanitary Sewer	Yes	No
Hudson Gardens	Communications	Yes	No
Iron Works Village Metro District	Irrigation	Yes	No
Level 3 (now CenturyLink)	Communications	Yes	Yes
MCI	Communications	Yes	Unknown
Metro Wastewater Reclamation District	Sanitary Sewer	Yes	Yes
Sheridan Sanitation District #2	Sanitary Sewer	Unknown	Unknown
South Englewood Sanitation District #1	Sanitary Sewer	Yes	No

Table 2. Utility Company, Type, and Facilities

Utility Company	Utility Type	Minor Utilities	Major Utilities ¹
Southeast Metro Stormwater Authority	Storm Sewer	Yes	No
Southwest Metro Water and Sanitation	Sanitary Sewer	Yes	No
Southwest Metro Water and Sanitation	Water	Yes	No
Sprint	Communications	Yes	Yes
Xcel Energy	Electric	Yes	Yes
Xcel Energy	Gas	Yes	Yes
Zayo	Communications	Yes	Yes

¹ Unknown: utility company did not respond or did not provide records, so it is unknown if the utility has major or minor facilities in the Infrastructure Study Area.

Each utility owner maintains the maps or records of their facilities and is responsible for the maintenance and expansion of their system. Water, sanitation, and storm providers may have master plans and capacity studies, but generally utility companies do not have formal plans. Utility expansion or adjustments are common to provide new service to accommodate growth and development.

3.4.2 Corridor Utilities

The utility assessment focused on major utilities that should be considered during the alternatives analysis and concept design phases of the *Santa Fe PEL Study (C-470 to I-25)*. Utility records collected include both minor and major utilities. All utility companies and facilities regardless of size should be evaluated as design progresses in subsequent project development phases.

The methodology used to identify major utility facilities in May and June 2020 included the following steps:

- Requested utility records through the Colorado 811 notification process.
- Conducted follow-up conversations with utility providers if records were not received.
- Reviewed Google Map desktop aerials.
- Reviewed utility owner-provided records for major facilities, including:
 - Critical telecommunications lines, including regional, backbone, or long-haul fiber.
 - Electric transmission lines, three phase primary lines, and substations.
 - Gas transmission lines or intermediate pressure lines (67 pounds per square inch) gauge or higher).
 - Water lines at least 24 inches in diameter.
 - Sanitary sewers at least 18 inches in diameter.
 - Storm sewers at least 36 inches in diameter.

The initial CO 811 notification identified 33 utility owners that were likely to have utility facilities within the Santa Fe Drive Infrastructure Study Area. Of these, four responded that they did not

have utilities in the study area, and five did not provide records or provided limited information on their facilities. Major utilities include four major fiber lines; primary electric lines; gas transmission; and large water, sanitary sewer, and storm sewer lines. Table 3 provides a summary of major utility facilities in the study area. These facilities are shown and listed in Appendix E.

Table 3. Summary of Major Utility Facilities

Utility Type	General Description
Communications	<ul style="list-style-type: none"> ▪ Major fiber east (Level 3 and Sprint in railroad right of way) and west (Zayo) of entire corridor ▪ CDOT Intelligent Transportation Systems west side of Santa Fe Drive
Electric	<ul style="list-style-type: none"> ▪ Underground primary electric generally west of Santa Fe Drive
Gas	<ul style="list-style-type: none"> ▪ Transmission line west of Santa Fe Drive and four crossings
Sanitary Sewer	<ul style="list-style-type: none"> ▪ 21 sanitary sewer lines, 18 inches to 66 inches
Storm Sewer	<ul style="list-style-type: none"> ▪ 18 storm sewer lines, 36 inches to 108 inches
Water	<ul style="list-style-type: none"> ▪ 4 City of Englewood 24-inch or 36-inch crossings, 1 Denver Water 30-inch crossing, and 1 Centennial Water and Sanitation District 24-inch crossing

While not considered major, additional utilities that should be considered as specific projects develop may include:

- CenturyLink and Comcast have local fiber and telephone communications lines to serve residents and businesses along the corridor.
- CDOT Region 1, Xcel Electric, and local agencies manage electric and fiber connections to traffic signals along the corridor.
- Xcel Energy provides power (flat-rate) and light standards for street lighting on Santa Fe Drive for CDOT.
- Denver Water distribution lines and water service feeds irrigation facilities for City and County of Denver and Iron Works Village Metro District.
- Douglas County has a project adjacent to the south end of the Infrastructure Study Area that will relocate utilities to tie into the existing CDOT Intelligent Transportation Systems (ITS), Xcel gas, and minor storm sewer lines.

It is possible that potential improvements would impact existing utility facilities. Where possible, project alternatives should avoid impacts to major utility facilities. Where avoidance is not possible, the following recommendations should be followed:

- During the NEPA and design phase, all utilities must be investigated and mapped to the achieved utility quality levels consistent with CRS 9-1.5. All utilities, not just major utilities,

should be identified. Note that additional utilities may have been permitted and installed in the corridor subsequent to the *Santa Fe PEL Study (C-470 to I-25)*. Other adjacent major capital improvement projects should be evaluated for recently relocated or constructed facilities, and the design should incorporate as-built utilities, as applicable.

- Proactive utility company coordination should be implemented during NEPA as a mitigation strategy. Updated utility records should be obtained from utility owners. As the design progresses to 90 percent (CDOT Final Office Review), the design team should discuss utility conflicts; opportunities to minimize conflicts; and the timing, location, and cost responsibility for necessary utility adjustments or relocations. Several utility companies (Arapahoe Community College and IT, Black & Veatch, Comcast, and Sheridan Sanitation District) did not respond or provide detailed records, so additional efforts should be made to engage them early in the design process.
- CDOT has established procedures for coordinating with utility companies when utilities may be impacted by a project. This coordination will be documented in project utility relocation plans, project special provisions, and utility agreement letters. CDOT's Region 1 Utility Engineer will review and issue a Utility Clearance prior to project advertisement.
- Costs related to the relocation of water lines, sanitary sewer, and storm sewer will be at project cost if owned by government agencies or nonprofit districts. Additional funding for utility relocations may be required for private utilities located within utility easements if private property is acquired for the project. Generally, utility relocation costs related to private utilities within the public right-of-way will be at utility owner cost, per 2 CCR 601-18.

3.5 Geologic Conditions

The existing geologic conditions within the Santa Fe Drive Infrastructure Study Area were evaluated and documented by a professional geologist. The geologic report is provided in Appendix F. The potential hazards described below are not considered to be of significant concern for potential improvement projects along the corridor and can be mitigated with the use of typical design and construction techniques.

The geologic hazard assessment also evaluated erosion potential and slope stability, and those factors were found to not pose potential hazards within the Infrastructure Study Area.

3.5.1 Swell and Collapse Potential

The substrate materials in much of the Santa Fe Drive corridor exhibit characteristics that may lead to potential for swelling or collapsing soils, consistent with materials conditions across the Colorado Front Range. During design, mitigation techniques for this potential hazard may include:

- Over-excavation of unsuitable material under pavement sections.
- Utilization of flexible retaining structures in lieu of rigid structures.
- Installation of drilled shafts in lieu of driven piles for deep foundations for structures.

3.5.2 Historical Fills

The South Platte River was a location of historic gravel mining operations, and the mined-out areas would often then be utilized as uncontrolled landfills. The deposits of debris, refuse, and other materials in an uncontrolled manner subsequently present geotechnical and environmental challenges related to settlement, stability, and presence of hazardous materials.

Several of these historical fill locations have been mitigated as a part of developments. However, during design and dependent upon the elements of the design, additional subsurface exploration should be completed to evaluate the presence and characteristics of any uncontrolled historical fill. Mitigation techniques to address these areas may include:

- Removal and replacement with suitable material
- Surcharging
- Grouting
- Installation of aggregate columns

In areas, the South Platte River was relocated to the west in the 1930s to accommodate Santa Fe Drive construction. The location of the old riverbed includes the potential for landfill material mentioned above, as well as the potential for irregular subsurface water patterns.

3.5.3 Soft Clays

In the Santa Fe Drive corridor near the W. Evans Avenue interchange, previous reports indicate the presence of soft clays to a depth of approximately 10 feet. These material conditions prompted the use of more bridge structure and fewer walls at this interchange to reduce the maximum wall height and reduce the risk of wall failure.

Potential infrastructure improvements within this area should consider these material challenges, and additional characterization of the on-site materials should be completed during design. The existing materials present settlement and stability concerns, and structure selection processes for walls and bridges will need to be informed by updated data. Mitigation techniques to address these areas may include:

- Staged construction.
- Utilization of flexible retaining structures in lieu of rigid structures.
- Ground improvements (e.g., stone columns).

3.6 Railroad

Rail facilities parallel the Santa Fe Drive corridor along its east side for much of its length. A minimum of two tracks are immediately adjacent to the corridor from W. Iowa Avenue to the south (excluding through Downtown Littleton). The Regional Transportation District's (RTD's) southwest light rail line also runs within this corridor and parallels the freight lines from Mineral Avenue north to Alameda Avenue (see Section 3.7 *Transit* for additional information).

The mainline rail facilities cross over the east-west streets that intersect Santa Fe Drive, and these rail crossings are frequently in close proximity to the intersection of the cross street and Santa Fe Drive. As described in Section 3.2 *Structures*, several of these crossings are on bridges with limited horizontal and vertical clearances. In several locations, the horizontal clearance does not allow for accessible sidewalks, limiting crossing options for non-vehicular modes. Potential infrastructure improvements identified along these cross streets (such as expanded turn lanes or auxiliary lanes or improved pedestrian/bicycle facilities to support multimodal connectivity and intersection operations) may need to consider potential modifications to or reconstruction of these crossings.

There is one at-grade rail crossing of the Santa Fe Drive corridor just south of W. Oxford Avenue. This single-track crossing is skewed, and vehicular traffic along Santa Fe Drive is controlled by a traffic signal separate from the signal at W. Oxford Avenue. This spur line services two commercial/industrial uses (metal recycler and lumber yard) to the west of Santa Fe Drive and south of W. Oxford Avenue. The crossing is operated by Union Pacific Railroad and is numbered crossing 921479M in the U.S. Department of Transportation (USDOT) Federal Railroad Administration inventory (updated May 2, 2019 for this crossing). It is not a quiet zone crossing, and it is utilized two times per day on average. Federal Railroad Administration crossing information indicates that the signal used to manage this crossing is interconnected to the CDOT signal network.

3.7 Transit

This section summarizes the existing and planned transit network in the Infrastructure Study Area. A number of transit services operate within the Infrastructure Study Area, including fixed bus and light rail transit (LRT) and on-demand/flex route service through FlexRide. Figure 15 illustrates the existing transit network along and/or crossing Santa Fe Drive.

3.7.1 RTD Fixed Transit Summary

3.7.1.1 Bus Service

While there are many bus routes within the broader area surrounding the Santa Fe Drive corridor, this section describes the routes with bus stops within the Infrastructure Study Area and the LRT stations immediately outside of it. Twenty-two fixed bus routes provide direct service to the Santa Fe Drive corridor. Only two routes run on the highway itself, in the southernmost section of the corridor from W. Mineral Avenue south to the project limits. Douglas County will soon construct improvements in this area to improve the bus stops at W. County Line Road. Similar to bus routes, there are very few bus stops actually on Santa Fe Drive. For the bus stops along the corridor and on intersecting streets, bicycle and pedestrian connections to/from the stops are key issues.

Figure 15. Transit



Source: RTD, 2020, pre-COVID service changes.

Most bus routes provide service across Santa Fe Drive or on parallel streets, with the light rail stations serving as major hubs for area transit service. All of these bus routes are considered local routes; a number of routes with limited stops (indicated by the "L" in the route name) provide faster service because they have fewer stops. While many of the transfer opportunities are located at the LRT stations, there are important transfer connections between multiple routes at major intersections along Santa Fe Drive, including W. Alameda Avenue, W. Mississippi Avenue, W. Bowles Avenue, and W. County Line Road.

The following is an overview of the routes serving the Santa Fe Drive corridor:

- Operating on the Santa Fe Drive corridor:
 - Route 402L
 - Route 403
- Providing access at LRT stations:
 - Alameda Station: Routes 1 (1st Avenue), 3 (Alameda Avenue), 4 (Morrison Road), 52 (W. 52nd Avenue/South Bannock)
 - I-25/Broadway Station: Routes 1 (1st Avenue), 11 (Mississippi Avenue), 14 (West Florida Avenue)
 - Evans Station: Route 21 (Evans Avenue)
 - Englewood Station: Routes 0/0L (South Broadway), 12 (Downing/N Washington), 35 (Hampden Avenue), 35 (Hampden Ave)
 - Oxford-City of Sheridan Station: Route 51 (Sheridan Boulevard)
 - Littleton/Downtown Station: Routes 29 (Riverbend), 36/36L (Fort Logan), 59 (West Bowles), 66 (Arapahoe Road), 67 (Ridge Road)
 - Littleton/Mineral Station: Routes 77 (Ken Caryl Avenue), 401 (Highlands Ranch/Mineral), 402L (Highlands Ranch Parkway)
- Parallel to the Santa Fe Drive corridor:
 - Routes 0/0L (South Broadway)
 - Route 12 (Downing/N Washington)

A summary of the current service for each route within the Infrastructure Study Area is provided in Table 4.

Table 4. Bus Service Summary

	Weekday Service			Saturday Service		Sunday Service	
	Frequency	Hours	Peak Frequency	Frequency	Hours	Frequency	Hours
Route 0	15 minutes	4:00 a.m. to 2:40 a.m.	10 minutes	15 minutes	4:00 a.m. to 3:10 a.m.	15 minutes	4:10 a.m. to 2:40 a.m.
Route 0L	6 minutes	5:30 a.m. to 9:00 a.m. 4:00 p.m. to 6:00 p.m.	6 minutes	N/A	N/A	N/A	N/A
Route 1	30 minutes	5:00 a.m. to 11:30 p.m.	15 minutes	1 hour	4:30 a.m. to 9:40 a.m.	1 hour	7:40 a.m. to 8:40 p.m.
Route 3	30 minutes	4:50 a.m. to 1:00 a.m.	30 minutes	30 minutes	4:50 a.m. to 1am	30 minutes	4:50 a.m. to 1:00 a.m.
Route 4	1 hour	5:30 a.m. to 8:10 p.m.	30 minutes	1 hour	6:00 a.m. to 7:10 p.m.	N/A	N/A
Route 11	30 minutes to an hour	4:40 a.m. to 11:45 p.m.	30 minutes	30 minutes	5:20 a.m. to 11:20 p.m.	1 hour	5:20 a.m. to 9:25 p.m.
Route 12	30 minutes	4:30 a.m. to 11:30 p.m.	30 minutes	30 minutes to an hour	5:40 a.m. to 11:30 p.m.	1 hour	5:40 am to 10:50 p.m.
Route 14	30 minutes	5:40 a.m. to 7:10 p.m.	30 minutes	30 minutes	6:00 a.m. to 7:10 p.m.	1 hour	8:30 a.m. to 6:40 p.m.
Route 21	30 minutes	5:00 a.m. to 12:40 a.m.	30 minutes	30 minutes	5:00 a.m. to 12:40 a.m.	30 minutes	4:50 a.m. to 12:40 a.m.
Route 29	30 minutes	5:40 a.m. to 12:45 a.m.	30 minutes	1 hour	5:55 a.m. to 12:50 a.m.	1 hour	5:55 a.m. to 12:50 a.m.
Route 35	30 minutes	5:20 a.m. to 7:50 p.m.	30 minutes	30 minutes to an hour	6:05 a.m. to 8:05 p.m.	1 hour	8:05 a.m. to 8:05 p.m.
Route 36	1 hour	5:15 a.m. to 11:50 p.m.	1 hour	1 hour	6:15 a.m. to 11:50 p.m.	1 hour	6:15 a.m. to 11:50 p.m.

Table 4. Bus Service Summary

	Weekday Service			Saturday Service		Sunday Service	
	Frequency	Hours	Peak Frequency	Frequency	Hours	Frequency	Hours
Route 36L	30 minutes	4:45 a.m. to 7:45 a.m. and 2:35 p.m. to 5:00 p.m.	30 minutes	N/A	N/A	N/A	N/A
Route 51	30 minutes	6:00 a.m. to 11:00 p.m.	30 minutes	30 minutes	5:00 a.m. to 10:00 p.m.	N/A	N/A
Route 52	30 minutes	5:55 a.m. to 8:30 p.m.	20 minutes	30 minutes	7:00 a.m. to 8:35 p.m.	1 hour	7:00 a.m. to 7:00 p.m.
Route 59	30 minutes	5:30 a.m. to 9:40 p.m.	30 minutes	1 hour	7:30 a.m. to 9:35 p.m.	1 hour	8:30 a.m. to 5:30 p.m.
Route 66	30 minutes	5:20 a.m. to 11:20 p.m.	30 minutes	1 hour	5:55 a.m. to 11:00 p.m.	1 hour	5:55 a.m. to 11:00 p.m.
Route 67	1 hour	5:40 a.m. to 8:40 p.m.	30 minutes	1 hour	8:40 a.m. to 7:40 p.m.	N/A	N/A
Route 77	1 hour	5:50 a.m. to 7:30 p.m.	30 minutes	N/A	N/A	N/A	N/A
Route 401	1 hour	5:10 a.m. to 7:40 p.m.	30 minutes	N/A	N/A	N/A	N/A
Route 402L	1 hour	5:10 a.m. to 9:40 p.m.	30 minutes	1 hour	6:25 a.m. to 9:30 p.m.	1 hour	8:25 a.m. to 6:30 p.m.
Route 403	1 hour	5:10 a.m. to 6:45 p.m.	30 minutes	N/A	N/A	N/A	N/A

Source: Data collected from RTD route schedules from August 2019, pre-COVID-19 service changes.

Notes: Service hours rounded to the nearest 5 minutes. Peak frequency defined as Monday-Friday 6:00-9:00 a.m. and 3:00-6:00 p.m. Routes were evaluated based on stops within or close to the Infrastructure Study Area. In cases where frequency changed beyond peak hours the average frequency was used.

3.7.1.2 Light Rail Service

The LRT corridor is known as the Southwest Line and includes the C Line and D Line, which terminate at the Littleton/Mineral Station. The C Line provides service to/from Union Station, while the D Line operates to/from the 18th Street/California Station. LRT stations are important transfer points between transit modes along the corridor. Both the C and D Lines operate at 15-minute frequencies during peak periods and 30-minute frequencies outside of peak periods. Table 5 includes full service details.

Table 5. Light Rail Service Summary

Route	Weekday Service			Saturday Service		Sunday Service	
	Frequency	Hours	Peak Frequency	Frequency	Hours	Frequency	Hours
C	30 minutes	4:10 a.m. to 11:30 p.m.	15 minutes	30 minutes to 2 hours (a.m.) 30 minutes (p.m.)	3:55 a.m. to 8:00 a.m. 5:50 p.m. to 1:27 a.m.	30 minutes to 2 hours (a.m.) 30 minutes to 1 hour (p.m.)	3:55 a.m. to 8:00 a.m. 5:50 p.m. to 11:30 p.m.
D	30 minutes	4:10 a.m. to 6:20 p.m.	15 minutes	10 minutes to 30 minutes	4:40 a.m. to 9:10 p.m.	10 minutes to 30 minutes	4:40 a.m. to 9:10 p.m.

Source: Data collected from RTD route schedules from January 2020, pre-COVID-19 schedule changes.

Notes: Service hours rounded to the nearest 5 minutes. Peak frequency defined as Monday-Friday 6:00-9:00 a.m. and 3:00-6:00 p.m. Routes were evaluated based on stops within or close to the Infrastructure Study Area. The C Line provides extended hours on Friday providing service till 1:30 a.m. Routes were evaluated using the northbound schedule, the southbound schedule has slightly different operating hours but maintain the same frequencies.

3.7.2 Special Services

3.7.2.1 FlexRide Summary

RTD's call and ride service with regularly scheduled and on-demand rides is known as FlexRide, a shared ride bus service that travels within select RTD service areas. It is open to the general public and is available on a first come, first serve basis. FlexRide can be used to connect to other RTD bus or train services at stations and Park-n-Rides, or get direct access to shopping malls, schools, businesses, recreational centers, libraries and more by booking a trip online. All FlexRide vehicles are accessible and have bike racks. RTD provides two FlexRide services within the Infrastructure Study Area. Both FlexRides provide flexible routes that do not require a reservation and operate during morning and evening weekday peak commuting hours.

The Platte Valley FlexRide route operates Monday through Friday during peak hours. The route runs clockwise and counterclockwise, both beginning at the Alameda LRT Station near the north end of the Infrastructure Study Area. The flex routes run from 5:30 a.m. to 8:47 a.m. and 2:35 p.m. to 5:54 p.m. with a frequency of 45 minutes.

The South JeffCo FlexRide route runs east and west from the Littleton/Mineral LRT Station to the Ken Caryl Park-n-Ride. The service operates from 6:10 a.m. to 10 p.m. during the weekdays and from 8:00 a.m. to 10:00 p.m. on Saturdays and riders can reserve a daily ride. Additional flex routes depart from the Littleton/Mineral LRT Station to Lockheed Martin and to the Littleton Downtown LRT Station. Both flex routes operate during rush hours only and do not offer weekend service.

3.7.2.2 Englewood Trolley

The Englewood Trolley provides service between the Englewood Station, businesses in downtown Englewood, and medical facilities in and near Craig Hospital and the Swedish Medical Center. Shuttles run approximately every 15 to 20 minutes and serve the designated stops. Service is provided from 6:30 a.m. to 6:30 p.m. during weekdays. The service started in 2004 and provides service to roughly 14,000 riders per month. The City of Englewood would like to expand existing service in the future.

3.7.2.3 Littleton Shopping Cart and Omnibus

Available to Littleton residents 55 years of age or older, the Littleton Shopping Cart (<https://www.littleton.gov/city-services/transportation/shopping-cart-senior-bus-service>) provides service six days a week between a number of different apartment complexes and grocery stores for older adults to go grocery shopping for themselves, even if a personal vehicle is not available to them. In an effort to make the routing, pick-up/drop-off, and destinations as clear as possible, there is an interactive map for people to plan their trips. Service is provided along Santa Fe Drive on Tuesdays from 10:00 a.m. to 2:00 p.m. Although appointments are not necessary, there are set times for pick-ups and drop-offs. There is no cost for the service, but donations are encouraged.

Similar to the Shopping Chart service, Omnibus (<https://www.littleton.gov/city-services/transportation/omnibus-appointment-only>) is available only to Littleton residents 55 years of age or older or for people with a disability for trips within Littleton. Although this service provides access to grocery shopping like the Shopping Cart service, the primary purpose is to provide transportation to medical services. Since the service is available to people with disabilities, all buses are wheelchair accessible.

Instead of being a fixed-route service, reservations are required with a 48-hour notice, and same day service is not accommodated. Weekday hours of operation are 8:00 a.m. – 4:00 p.m. Monday through Friday, with appointments available 9:00 a.m. to 3:00 p.m. While serving people for medical trips is the top priority, trips for grocery shopping, hair appointments, and other activities are available as seating permits. Destinations within the city limits are included, with three exceptions that have day and/or time restrictions.

3.7.3 Park-N-Rides

Park and rides play an important role in the transit system, especially in lower-density areas where walking and bicycling to transit is less feasible. A parking analysis was developed to present the current parking demand and mitigation options for RTD facilities on Santa Fe Drive between C-470 and I-25. The *Parking Analysis Report* is included as Appendix G. There are six

park-n-ride facilities within the study area (the Oxford-City of Sheridan Station is the only station without parking), with different services and parking fee options: 1) bus service without parking fees; 2) rail service without parking fees; and 3) bus and rail service with parking fees. The six park and rides within the service area are highly utilized, ranging from 84 percent to 97 percent based on average 2019 data. Within the study area, the Evans Station has the highest parking utilization, with an average of 97 percent full while the Broadway and I-25 Station has the lowest parking utilization of 84 percent full. See Table 6 and Figure 16 for full details.

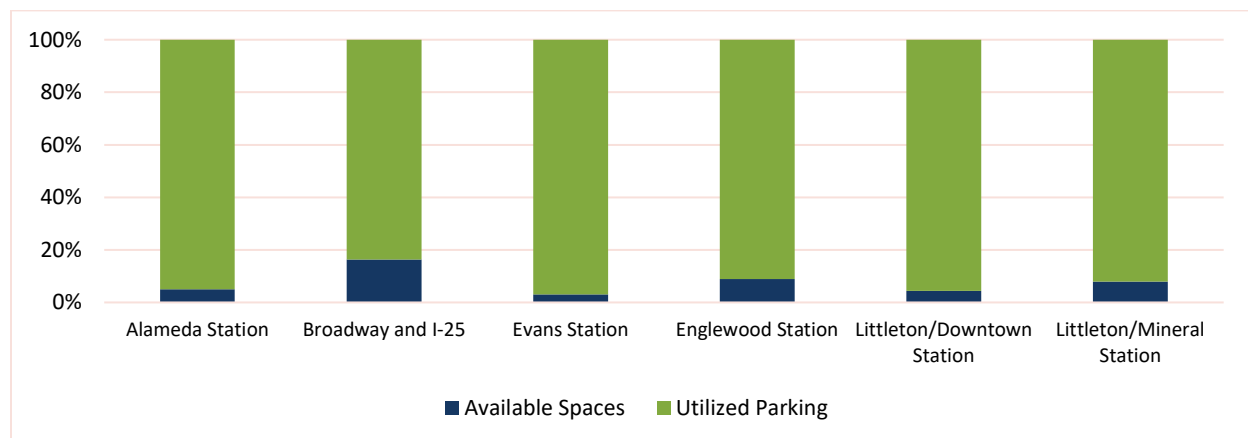
Table 6: Park-N-Ride Capacity and Utilization

Park and Ride	Capacity	Utilized Spaces		Remaining Spaces	
		Number	Percent	Number	Percent
Alameda Station	40	38	95%	2	5%
Broadway and I-25	221	185	84%	36	16%
Evans Station	99	96	97%	3	3%
Englewood Station	910	829	91%	81	9%
Littleton/Downtown Station	361	345	96%	16	4%
Littleton/Mineral Station	1227	1130	92%	97	8%
<i>Total</i>	<i>2858</i>	<i>2623</i>	<i>92%</i>	<i>235</i>	<i>8%</i>
<i>LRT Total</i>	<i>15365</i>	<i>10582</i>	<i>69%</i>	<i>4783</i>	<i>31%</i>

Source: Parking Analysis Report (Appendix G).

Parking for LRT stations along Santa Fe Drive is limited, which may result in more commuters choosing to drive to downtown Denver rather than ride transit. When a park-n-ride is full, spillover problems occur because motorists park on side streets and in business parking lots. This can cause issues for people accessing the businesses and lead to tension between surrounding businesses and RTD.

Figure 16: Park –N- Ride Average Daily Utilization



Source: Data from RTD 2019 average utilization report.

3.7.4 Planned Transit Projects

There are two funded projects that will benefit transit within the Infrastructure Study Area:

- US 85 Widening Project from Highlands Ranch Parkway to Dad Clark Gulch: New bus stops on Santa Fe Drive at W. County Line Road.
- Oxford Avenue Bicycle/Pedestrian Bridge: Bicycle/Pedestrian bridge providing access over Santa Fe Drive to the Oxford-City of Sheridan Station.

In addition to these funded projects, planning efforts have identified potential (unfunded) transit improvements for segments and intersections along and adjacent to the corridor. The Southwest Line C and D line extension, commonly referred to as the Southwest Rail Extension, is included in the 2004 FasTracks plan. The extension will lengthen the line 2.5 miles from the Littleton/Mineral Station to Lucent Boulevard in Highlands Ranch. The extension will include a new end-of-line station at C-470 and Lucent Boulevard with 1,000 parking spaces. At the time this report was prepared, RTD and stakeholders are still in the process of securing funding and confirming the construction schedule for the Southwest Rail Extension.

Additional planned projects related to transit are identified in Table 7.

Table 7. Transit Planned Improvements Related to Santa Fe Drive Corridor

Lead Agency	Plan	Description of Recommended Improvements
City of Englewood	<i>Englewood Light Rail Corridor Plan</i> (City of Englewood, 2013)	<ul style="list-style-type: none"> ▪ Improve existing Englewood and Oxford-City of Sheridan Stations (bike parking, trail connections, general facility improvements).
City of Englewood	<i>Englewood Forward Light Rail Corridor Next Steps Study</i> (City of Englewood, 2015a)	<ul style="list-style-type: none"> ▪ Improve Oxford-City of Sheridan Station by creating a park-n-ride. ▪ Improve intersections to help improve travel time for transit users and for vehicles.
City of Englewood	<i>Englewood Forward Comprehensive Plan</i> (City of Englewood, 2016)	<ul style="list-style-type: none"> ▪ Enhance downtown streets for better transit usage. ▪ Encourage transit-oriented development where applicable.
City of Littleton	<i>Envision Littleton Transportation Master Plan</i> (City of Littleton, 2019b)	<ul style="list-style-type: none"> ▪ Downtown/Arapahoe Community College: bus stop/mobility hub improvements (amenities, wayfinding, stop connectivity). ▪ Littleton/Mineral Station: construct a parking garage (1,500 spaces).
City and County of Denver	<i>Denver Moves: Transit Plan</i> (City and County of Denver, 2019b)	<ul style="list-style-type: none"> ▪ Improve LRT frequency down Santa Fe Drive to 15 minutes.

3.8 Bicycle and Pedestrian Facilities

This section summarizes bicycling and pedestrian activity and accommodation in and around the Infrastructure Study Area. This includes on-street bicycle facilities (where only bicyclists are allowed), multiuse paths/trails (where both bicyclists and pedestrians are allowed), and sidewalks (as primarily pedestrian facilities).

3.8.1 Bicycle Facilities and Operations

Existing bicycle facilities are shown in Figure 17 through Figure 19.

3.8.1.1 On-Street Bicycle Facilities

While Santa Fe Drive has a shoulder wide enough to accommodate bicyclists in many places and bicyclists are technically allowed to ride on the corridor, no agency data identifies the highway as a bicycle facility. Because of high vehicle speeds and volumes, most bicyclists choose not to ride on Santa Fe Drive and instead choose nearby north-south bicycle facilities, like the South Platte River/Mary Carter Greenway Trail that runs parallel to Santa Fe Drive west of the highway.

Most cross streets with a bike facility are shared roadways. Many of the facilities provide connections to the RTD Southwest Line Light Rail Stations that are just to the east of Santa Fe Drive. The few defined bike lanes in the City and County of Denver are east and west of the corridor, such as S. Washington Street and W. Bayaud Avenue, and connect to shared roadways. In the City of Englewood, most bike facilities are defined as bike routes. The majority of these are located on residential streets that provide connections to the Englewood Light Rail Station, like W. Bates Avenue. There are two striped bike lanes that are shared with on-street parking. City of Littleton bike facilities consist primarily of shared roadways, connecting to the Littleton/Downtown and Littleton/Mineral Light Rail Stations. There is also a striped bike lane along Ridge Road that provides a connection to S. Prince Street, which leads to the Littleton/Mineral Station.

3.8.1.2 Off-Street Multiuse Paths/Trails

A number of off-street facilities provide enhanced environments for bicyclists and pedestrians with facilities separated from vehicle traffic. The trail facilities in and around the Santa Fe Drive corridor are described in Table 8. The South Platte River/Mary Carter Greenway Trail provides a strong north-south connection with a number of grade separated crossings, including two locations where the trail passes under Santa Fe Drive (one near Vanderbilt Park and the other near Overland Lake) and another underpass at W. Mississippi Avenue. A number of trails crossing Santa Fe Drive provide east-west connections across the corridor. Grade-separated crossings for these east-west trails along the corridor include:

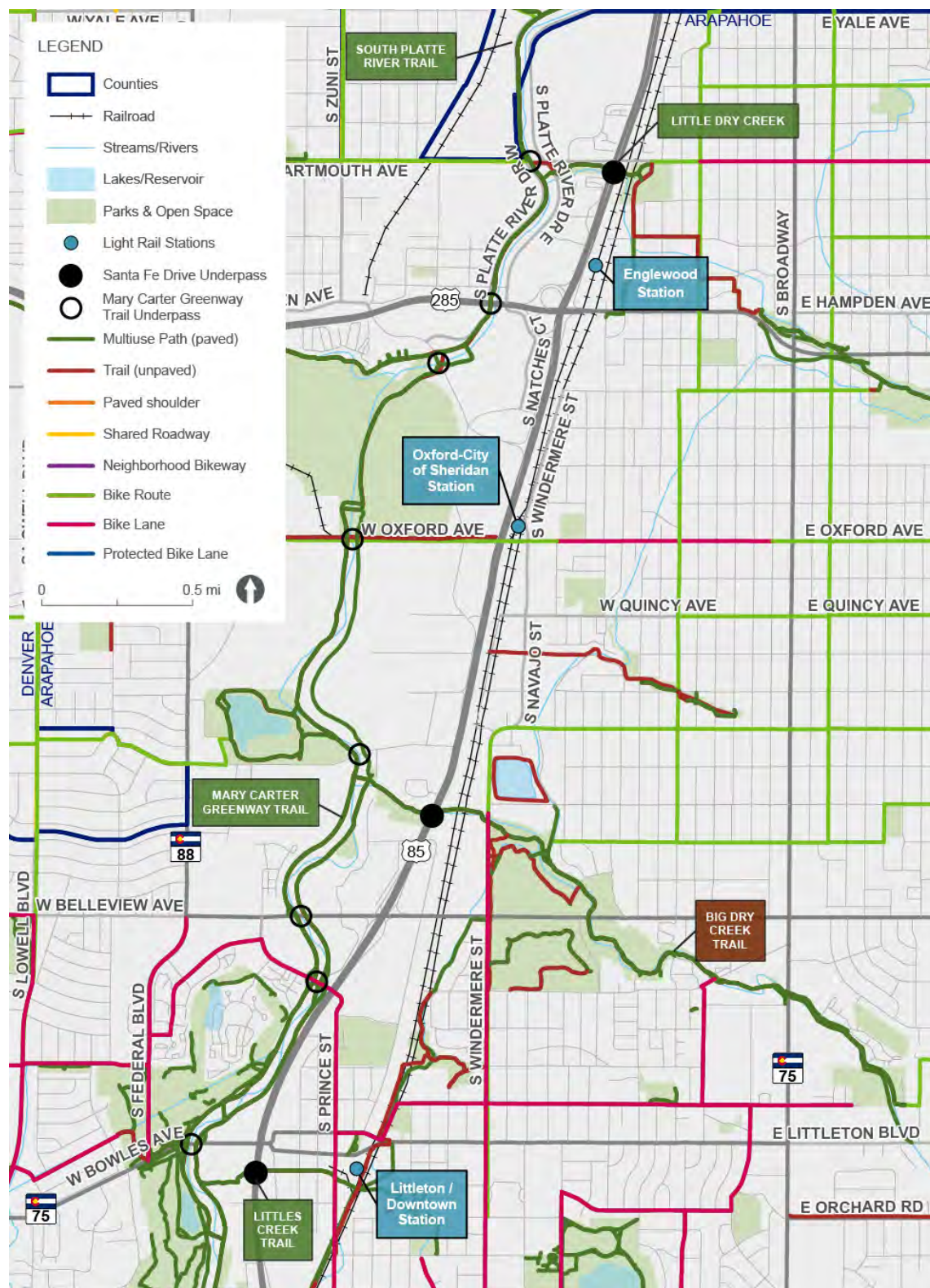
- North of Brewery Lane (Lee Gulch Trail)
- South of W. Bowles Avenue (Littles Creek Trail)
- South of W. Union Avenue (Big Dry Creek Trail)
- South of W. Dartmouth Avenue (Little Dry Creek Trail)

Figure 17. Bicycle Facilities (1 of 3)



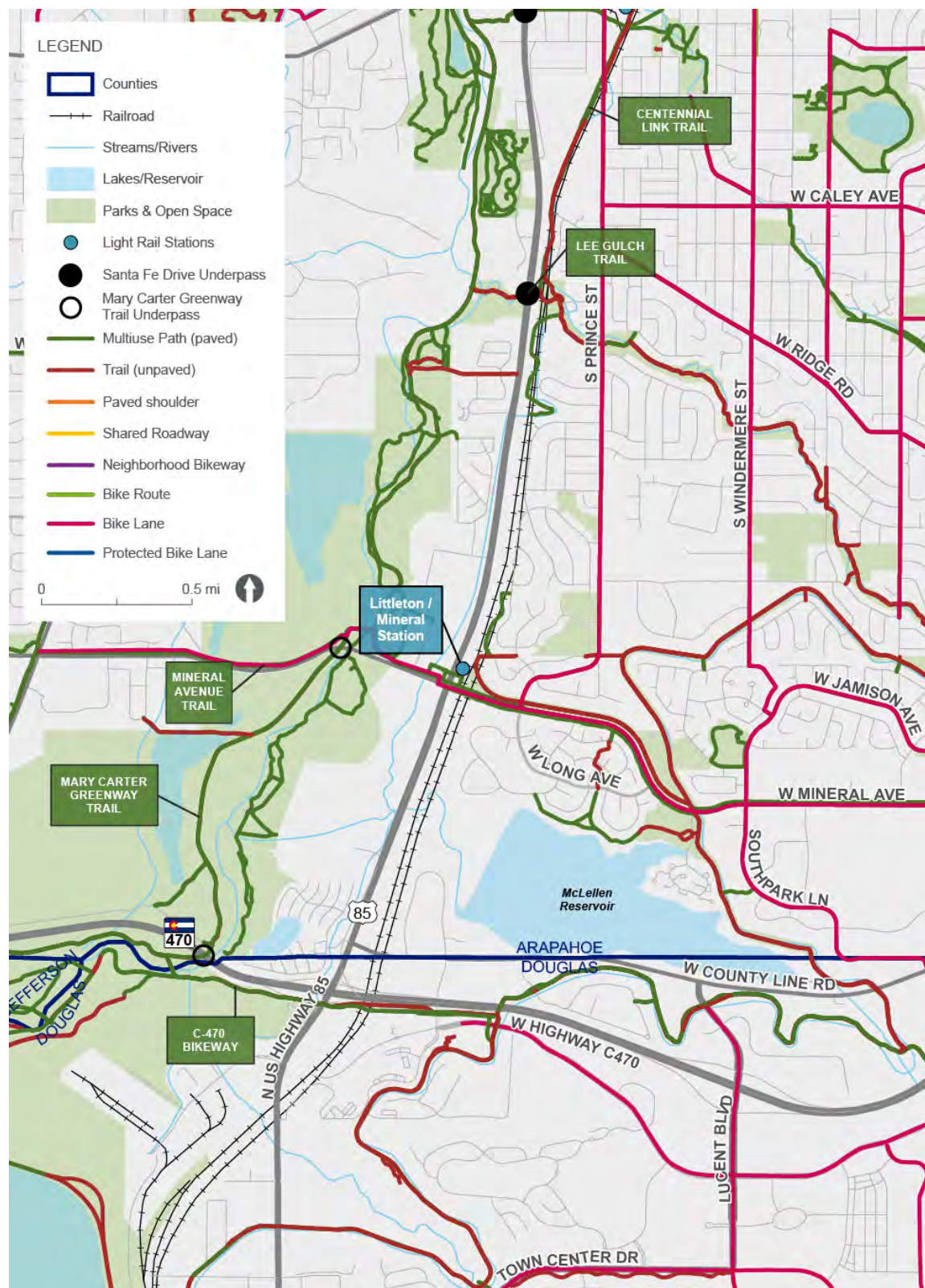
Source: Arapahoe County, City and County of Denver, DRCOG, Douglas County, City of Englewood, City of Littleton, 2020

Figure 18. Bicycle Facilities (2 of 3)



Source: Arapahoe County, City and County of Denver, DRCOG, Douglas County, City of Englewood, City of Littleton, 2020

Figure 19. Bicycle Facilities (3 of 3)



Source: Arapahoe County, City and County of Denver, DRCOG, Douglas County, City of Englewood, City of Littleton, 2020

Table 8. Multiuse Path Facilities

Name	Description	Width	Surface	Buffer
South Platte River Trail	Runs north-south along the South Platte River, west of Santa Fe Drive, with access north to Denver.	9 feet measured at W. Mississippi Avenue	Paved	Detached trail with landscaping that is slightly below grade.
Mary Carter Greenway Trail	Continues the South Platte River Trail and begins just north of River Point Parkway.	10 feet measured at S. Prince Street	Paved	Detached trail that is slightly below grade. Landscaping includes trees.
D-18 Trail	Provides access to the west of Santa Fe Drive on the south side of W. Florida Avenue to the Mary Carter Greenway Trail.	10 feet measured west of Santa Fe Drive	Paved	Detached trail with landscaped buffer. Landscaping includes trees.
Oxford Avenue Trail	Provides access to the west of Santa Fe Drive to the Mary Carter Greenway Trail.	14 feet measured west of Santa Fe Drive	Paved	Attached trail.
Big Dry Creek Trail	Begins at the Mary Carter Greenway Trail just south of W. Union Avenue and provides access to Littleton.	9 feet measured at S Windermere Street	Paved	Detached trail with a strong buffer from most roadways. Landscaping includes trees.
Little Dry Creek Trail	Connects to the South Platte River trail south of W. Dartmouth Avenue and provides access to Englewood. There is a section east of Broadway as well.	8 feet measured at W. Dartmouth Avenue	Paved	Detached trail that is slightly below grade. Landscaping includes trees.
Littles Creek Trail	Connects S. Prince Street to Mary Carter Greenway Trail south of W. Bowles Avenue.	10 feet measured east of Santa Fe Drive	Paved	Detached trail through urban and landscaped areas.
Centennial Link Trail (Littleton Community Trail)	Begins at W. Littleton Boulevard and travels south connecting to Lee Gulch Trail.	8 feet measured south of Littleton Boulevard	Unpaved	Detached for most of the trail traveling along the railroad, some portions along residential streets. Landscaping includes trees.

Table 8. Multiuse Path Facilities

Name	Description	Width	Surface	Buffer
Lee Gulch Trail	Branches off from the Mary Carter Greenway Trail south of S. Vinewood Street and provides access to Littleton.	10 feet measured at S. Prince Street	Unpaved	Detached trail with a strong buffer from busy roads. Landscaping includes trees.
Brewery Lane Trail	Provides access directly from Santa Fe Drive along Brewery Lane to connect with Reynold's Landing and the Mary Carter Greenway Trail	6 feet measured just west of Santa Fe Drive at start of facility	Paved	Detached trail with landscaped buffer from road.
Mineral Trail	Runs parallel to W. Mineral Avenue and provides connection to Littleton/Mineral Station with connection to Mary Carter Greenway Trail.	9 feet measured at the Littleton/Mineral Station	Paved	Detached trail with landscaping and buffer from the road.
C-470 Bikeway	Runs parallel to C-470 and provides connection to Mary Carter Greenway Trail.	10 feet measured at Santa Fe Drive	Paved	Detached trail with landscaping. In some areas there is a stronger buffer present.

For details associated with the environmental resource aspects of trails (Section 4(f)), reference Section 5.5 *Parks, Trails and Open Space, and Wildlife and Waterfowl Refuges*.

Although no bicycle counts were available for the facilities within the Infrastructure Study Area, bicycle activity heat maps from Strava (an exercise/recreation smartphone app) taken from user data in 2017 infer that the South Platte River Trail experiences a very high level of bicycle activity. Strava tracks location and mileage statistics primarily for bicyclists, and data is displayed through an online platform. The data derived from this app is limited to people who are using the app, so it does not provide actual bicycle counts. It does provide an indication of higher and lower levels of bicycle activity along specific routes. The Little Dry Creek Trail (which crosses Santa Fe Drive just south of W. Dartmouth Avenue) also experiences a high level of activity. Additional cross streets experiencing strong bicyclist activity are W. Alameda Avenue, W. Florida Avenue, and W. Dartmouth Avenue (east of Little Dry Creek Trail). The heat maps indicating relative bicyclist activity from Strava are depicted in Figure 20. Similar to the northern section of the corridor, the South Platte River/Mary Carter Greenway Trail experiences a very high level of bicycle activity in the southerly section. The trail crossings at Big Dry Creek Trail (south of Union Avenue) and Lee Gulch Trail (east of Euclid Avenue) also have a high level of activity. The crossings of W. Oxford Avenue, W. Bowles Avenue, and W. Mineral Avenue also experience strong bicycle use.

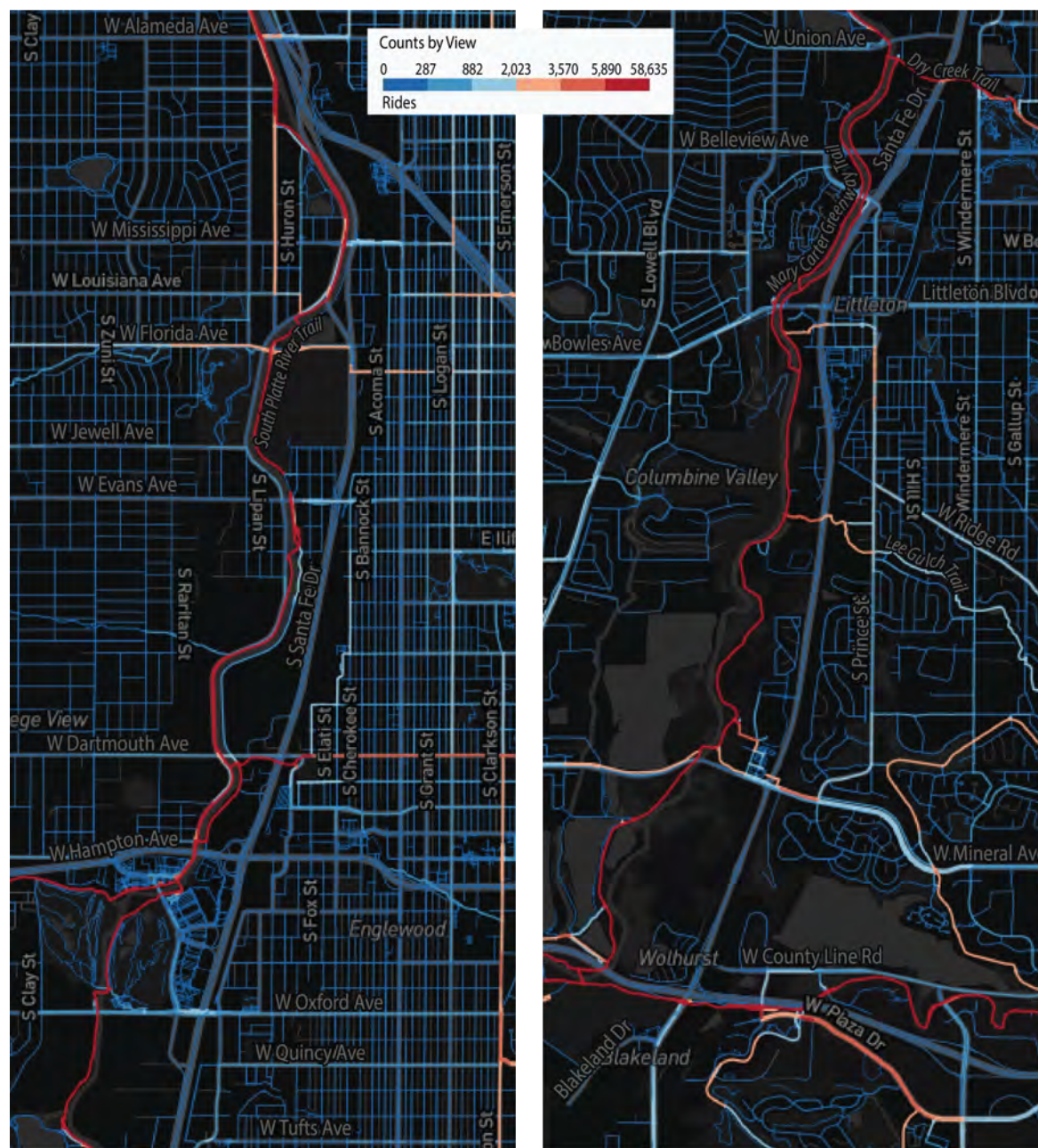
3.8.2 Pedestrian Facilities

This section summarizes the pedestrian facilities along and crossing the Santa Fe Drive Infrastructure Study Area.

There are relatively short sections of sidewalks located immediately on the Santa Fe Drive corridor. There are frequent gaps in the sidewalk infrastructure, and it often is only provided on the west side of the highway. The width and condition of the sidewalk varies—some sidewalks are relatively narrow with overgrowth and other sidewalks are wider and detached from the roadway. While there is a mix of detached and attached sidewalks, most of the sidewalks are attached, with little to no buffer from the highway.

Pedestrian conditions at the W. Hampden Avenue interchange and at the W. Oxford Avenue signalized intersection present particular challenges with surrounding land uses. There is a worn path on the north side of W. Hampden Avenue through the interchange that people are using to travel under Santa Fe Drive. There are apartments and neighborhoods on the west side of Santa Fe Drive and retail, employment, and the Englewood LRT Station on the east side. W. Oxford Avenue has also been identified as an important pedestrian corridor by the Colorado Center for the Blind, based on their clients' experience at this location. This is a difficult intersection for people with sight impairments to navigate. The Colorado Center for the Blind is located south of downtown Littleton, and their clients utilize the W. Bowles Avenue and W. Oxford Avenue intersections, as well as the Downtown Littleton LRT station, to access the facility and to work with their clients to learn how to navigate difficult intersections. Pedestrians with visual impairments are frequently observed along W. Mineral Avenue and along W. Bowles Avenue in the study area.

Figure 20. Corridor Strava Heat Maps



Source: Strava Metro Data Online Platform, data from 2017 (http://metro-static.strava.com/dataView/CO/201701_201712/RIDE/#13.42/39.6680/-105.0082)

For both pedestrians and bicyclists, at-grade crossings at the intersections/interchanges along the corridor can be difficult and/or uncomfortable conditions, including channelized free right-turn lanes, wide intersections, missing/faded crosswalks, and prohibited crossings. These types of conditions at the major intersections are listed in Table 9. The interchanges at W. Evans Avenue, W. Hampden Avenue, and W. Belleview Avenue add additional unique challenges with elements like free-flow ramp turning movements and closely spaced intersections with multiple conflict points.

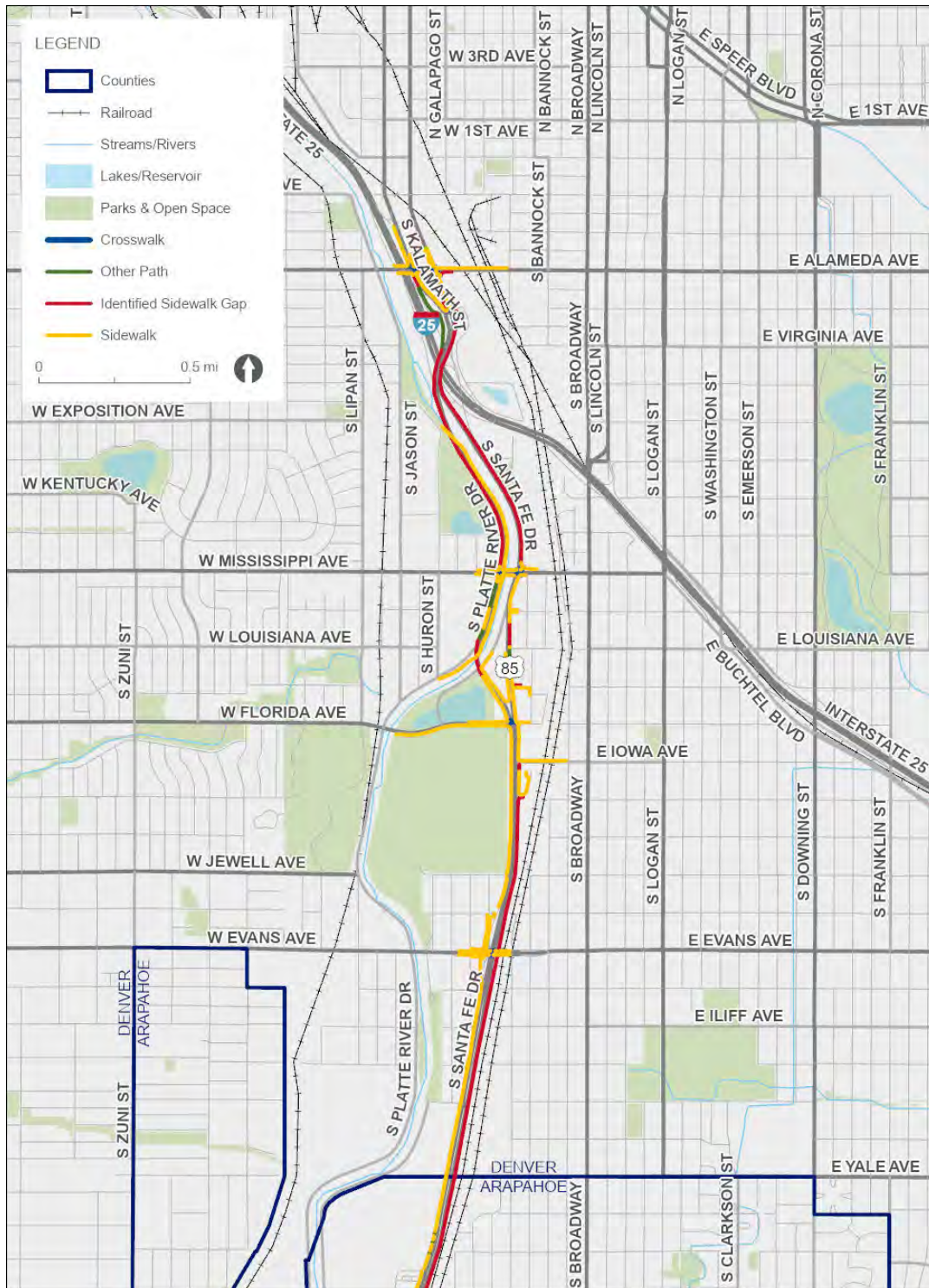
Table 9. At-grade Crossing Details

Major Intersection	Channelized Free Right-Turn Lane	Wide Intersections (8+ Total Lanes Without Refuge)	Missing/Faded Crosswalks	Prohibited Crossings
W. Alameda Avenue	Y	N	N	N
W. Mississippi Avenue	Y	N	Y	N
W. Florida Avenue	N	Y	Y	Y
W. Iowa Avenue	N	Y	Y	Y
W. Dartmouth Avenue	Y	Y	N	N
W. Oxford Avenue	Y	Y	N	Y
W. Union Avenue	N	N	N	Y
S. Prince Street	Y	Y	N	Y
W. Bowles Avenue/ Littleton Boulevard	Y	Y	N	N
W. Mineral Avenue	Y	N	N	N
W. County Line Road	Y	N	N	Y

Source: DEA

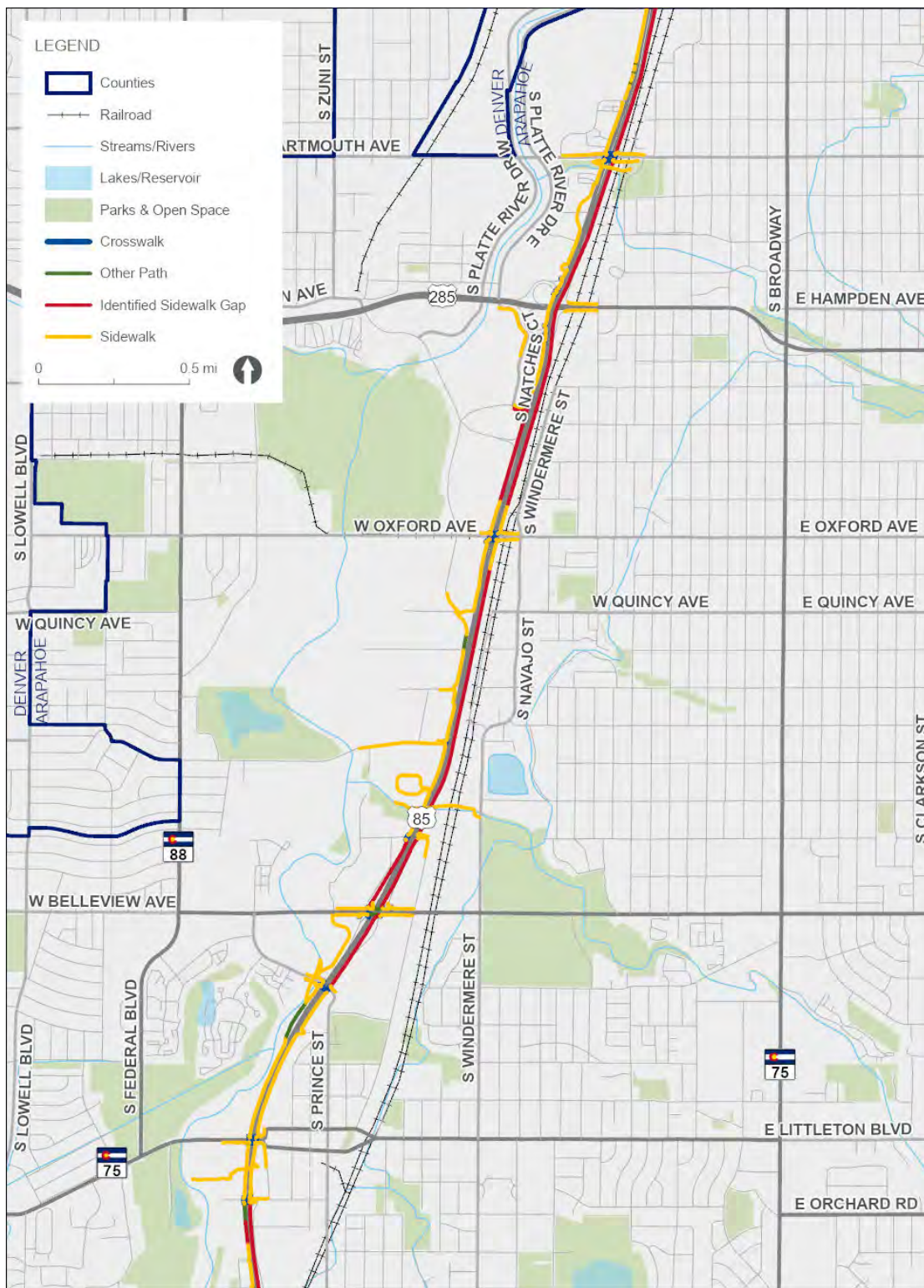
Figure 21 through Figure 23 show the sidewalk facilities adjacent to and crossing the corridor, as well as identified sidewalk gaps.

Figure 21. Sidewalk Facilities (1 of 3)



Source: DRCOG Sidewalk Centerlines 2018 and data immediately along the corridor verified by project staff

Figure 22. Sidewalk Facilities (2 of 3)



Source: DRCOG Sidewalk Centerlines 2018 and data immediately along the corridor verified by project staff

Figure 23. Sidewalk Facilities (3 of 3)



Source: DRCOG Sidewalk Centerlines 2018 and data immediately along the corridor verified by project staff

3.8.3 Pedestrian and Bicycle Planned Improvements

A number of funded projects that will benefit bicyclists and pedestrians will occur in the Infrastructure Study Area:

- Overland Golf Course Sidewalk: New sidewalk on the west side of Santa Fe Drive between W. Florida Avenue and W. Jewell Avenue, running the length of the Overland Golf Course.
- W. Alameda Avenue Underpass: Minor improvements between Santa Fe Drive and W. Cherokee Street.
- W. Jewell Avenue Pedestrian Bridge: Bridge over Santa Fe Drive and the railroad lines to connect east and west residents via W. Jewell Avenue.
- W. Floyd Avenue Protected Bike Lanes: Protected bike lanes providing access along W. Floyd Avenue to the Englewood Station.
- 85 Widening Project from Highlands Ranch Parkway to Dad Clark Gulch bike and pedestrian improvements: Underpass under Santa Fe Drive south of C-470 and shared use path on the east side of Santa Fe Drive south of C-470. Pedestrian improvements north of C-470 to connect to bus stop improvements at W. County Line Road.

In addition to the funded projects, planning efforts have identified potential (unfunded) pedestrian and bicycle improvements for segments and intersections along and adjacent to the corridor. The recommendations improve access to LRT stations, improve intersections, provide separated facilities, and identify grade-separated crossings. Table 10 summarizes each plan with a description of the improvement recommendations relevant to this corridor.

Table 10. Pedestrian and Bicycle Planned Improvements related to Santa Fe Drive Corridor

Lead Agency	Plan	Description of Recommended Improvements
Arapahoe County	Arapahoe County Bicycle and Pedestrian Master Plan	<ul style="list-style-type: none"> • Mary Carter Greenway Trail: widening from W. Bowles Avenue to W. Dartmouth Avenue, W. Bowles Avenue to Union Avenue, and Riverpoint Parkway into Denver. • Littles Creek Trail: connector trail from S. Bemis Street to Santa Fe Drive. • Connector Trail: Big Dry Creek Trail south of W. Belleview Avenue and from W. Belleview Avenue to Big Dry Creek Trail. • Santa Fe Trail: trail connecting Big Dry Creek Trail to W. Bates Avenue. • South Platte River Trail: east side of river from Riverpoint Parkway into Denver. • W. Oxford Avenue: buffered bike lane from Santa Fe Drive to S. Broadway. • Santa Fe Drive: sidewalk on west side from W. Lake Avenue to W. Church Avenue. • US 285 (W. Hampden Avenue): grade separated crossing at US 285 and Santa Fe Drive Rail Trail. • Englewood Light Rail Station: pedestrian bridge over Santa Fe Drive.

Table 10. Pedestrian and Bicycle Planned Improvements related to Santa Fe Drive Corridor

Lead Agency	Plan	Description of Recommended Improvements
Arapahoe County	<i>South Platte Connections Study (Arapahoe County, 2019)</i>	<ul style="list-style-type: none"> ▪ W. Oxford Avenue: grade separated crossing at W. Oxford Avenue and Santa Fe Drive. ▪ W. Dartmouth Avenue: bike lanes and sidewalks west of Santa Fe Drive, separated bike lanes east of Santa Fe Drive, rail trail, and improved wayfinding ▪ US 285 (W. Hampden Avenue): sidewalk connections, Loop Ramp Trail connection, Englewood Station pedestrian bridge, and improved routing and wayfinding ▪ W. Oxford Avenue: intersection improvements at Santa Fe Drive, Northeast Trail connections to River Run Trailhead/Mary Carter Greenway Trail, Southwest Trail connection and mid-block crossing improvements to Mary Carter Greenway Trail, and buffered bike lanes on W. Oxford Avenue ▪ W. Belleview Avenue: Northeast Trail connection to Mary Carter Greenway Trail, sidewalk improvements, improved wayfinding, interchange improvements at Santa Fe Drive, and construct an underpass at Slaughterhouse Gulch ▪ W. Bowles Avenue: Southwest Trail connection and roundabout, northwest trail connection to Mary Carter Greenway Trail, southeast trail connection to Mary Carter Greenway Trail, improved wayfinding, and Santa Fe Drive underpass ▪ W. Mineral Avenue: Jackass Hill Trail connections to Littleton/Mineral Station, trail connection through park-n-ride, and W. Mineral Avenue and Santa Fe Drive intersection reconfiguration
City and County of Denver	<i>Denver Moves: Pedestrians & Trails (City and County of Denver, 2019d)</i>	<ul style="list-style-type: none"> ▪ W. Iowa Avenue Improvements: Various improvements, including the removal of the stairs to create an Americans with Disabilities Act accessible path, and a new trail offset from Santa Fe Drive from W. Jewell Avenue to W. Florida Avenue. ▪ W. Evans Avenue and Santa Fe Drive: improve existing sidewalk infrastructure ▪ Broadway Station: trail from South Platte River Trail at Vanderbilt Park through the Broadway Station over the Consolidated Main Line ▪ South Platte River Trail: bridge connection over the river connecting the trail on the east side of W. Jewell Avenue and on the west side
City of Englewood	<i>Englewood Light Rail Corridor Plan (City of Englewood, 2013)</i>	<ul style="list-style-type: none"> ▪ Extending W. Floyd Avenue west of S. Inca Street ▪ Rail Trail east of Santa Fe Drive ▪ W. Dartmouth Avenue/US 285 (W. Hampden Avenue)/W. Oxford Avenue: rail trail bridge ▪ Englewood Parkway: protected bikeway enhancements
City of Englewood	<i>Englewood Forward Walk and Wheel Master Plan Program</i>	<ul style="list-style-type: none"> ▪ W. Iliff Avenue: overpass with improved bikeway ▪ W. Dartmouth Avenue: protected bikeway improvements; intersection improvements at Santa Fe Drive and S. Inca Street

Table 10. Pedestrian and Bicycle Planned Improvements related to Santa Fe Drive Corridor

Lead Agency	Plan	Description of Recommended Improvements
	(City of Englewood, 2015b)	<ul style="list-style-type: none"> ▪ US 285 (W. Hampden Avenue): overpass ▪ W. Oxford Avenue: improved pedestrian corridor; intersection improvements at Santa Fe Drive and S. Navajo Street ▪ Rail Trail east of Santa Fe Drive ▪ Frontage Road: bikeway
City of Englewood	<i>Englewood Forward Light Rail Corridor Next Steps Study</i> (City of Englewood, 2015a)	<ul style="list-style-type: none"> ▪ Englewood Station: pedestrian tunnel/bridge ▪ W. Dartmouth Avenue: construct protected bikeway from S. Inca Street to S. Federal Boulevard ▪ Little Dry Creek Trail: bike and pedestrian improvements along frontage road west of Santa Fe Drive, improving connection to Mary Carter Greenway Trail ▪ W. Dartmouth Avenue/US 285 (W. Hampden Avenue)/W. Oxford Avenue: rail trail bridge ▪ Bikeway Loop: protected bikeway along W. Dartmouth Avenue to S. Inca Street to S. Clarkson Street, along S. Clarkson Street from W. Dartmouth Avenue to W. Oxford Avenue and along W. Oxford Avenue
City of Englewood	<i>Englewood Forward Comprehensive Plan</i> (City of Englewood, 2016)	<ul style="list-style-type: none"> ▪ Enhanced downtown streets for better transit usage ▪ Improved access to Mary Carter Greenway Trail along W. Oxford Avenue ▪ Rail Trail connection for City Center and Downtown ▪ Connections to Englewood Station south of W. Dartmouth Avenue
City of Littleton	<i>Envision Littleton Transportation Master Plan</i> (City of Littleton, 2019b)	<ul style="list-style-type: none"> ▪ S. Windemere Street: protected bike lane from W. Layton Avenue to Littleton Boulevard to Ridge Road ▪ W. Church Avenue: protected bike lane from Santa Fe Drive to S. Prince Street ▪ Santa Fe Drive: improvements at W. Belleview Avenue for cyclists ▪ Mary Carter Greenway Trail: widening bridges at W. Bowles Avenue and W. Mineral Avenue ▪ Santa Fe Drive: improvements at W. Mineral Avenue for cyclists ▪ Santa Fe Drive: grade-separated crossing at Slaughterhouse Gulch Trail ▪ Santa Fe Drive: grade-separated crossing at Dad Clark Gulch ▪ Mineral Avenue: shared-use path between Santa Fe Drive and Jackass Hill Road

4. Traffic and Operations

4.1 DRCOG Land Use and Travel Demand Model

An important factor in future conditions along the corridor will be regional development that can add significant traffic volume to Santa Fe Drive and its cross streets. To confirm that the traffic modeling process reflects these conditions, the project team reviewed population and employment figures throughout the southern Denver metropolitan area.

DRCOG's travel demand model is used to forecast future traffic volumes on Santa Fe Drive. The travel demand model uses socioeconomic projections for the Denver metropolitan area to generate travel demand. The socioeconomic information encompasses population and employment for a base year (2020) and forecasts for a future horizon year (2040).

The socioeconomic data sets are based on local comprehensive land use plans. These plans are prepared by local governments to guide development of their respective jurisdictions into the future. DRCOG references this information to develop geographically allocated socioeconomic forecasts of future population and employment that conform to regional control totals developed by the State Demography Office. The geographic areas, termed Transportation Analysis Zones (TAZ), are much larger than parcel-based land use plans. The 2020 base year calculations use the U.S. Census, local survey results, and other available data to reflect observed population and employment numbers. The 2040 forecasts incorporate development plans, zoning policies, and other factors to geographically project future numbers of population and employment. This information is the primary input to the travel demand model.

4.1.1 Model Socioeconomic Data

The existing and future demographic data were collected from the 2020 and 2040 DRCOG models, respectively. Data was collected for TAZs as far north as downtown Denver, as far south as Castle Rock, as far west as Wadsworth Boulevard, and as far east as I-25. This expanded area was used to capture not only development along Santa Fe Drive, but regional development that could induce trips that use the corridor.

To normalize the population and employment data from the models (in residents/jobs), they were divided by the area of each TAZ to determine densities (in residents/jobs per square mile). In this manner, zones that are larger in geographic area are not overrepresented and smaller zones are not underrepresented. The resulting population and employment densities for the existing year 2020 are shown in Figure 24 and Figure 25, respectively. The population and employment densities in the future year 2040 are shown in Figure 26 and Figure 27, respectively.

Finally, the changes in number of residents and number of jobs are shown in Figure 28 and Figure 29. The 25 highest-growth TAZs are highlighted. Note that the changes are measured in residents and jobs, taken directly from the DRCOG models.

Figure 24. 2020 DRCOG Model Population Density

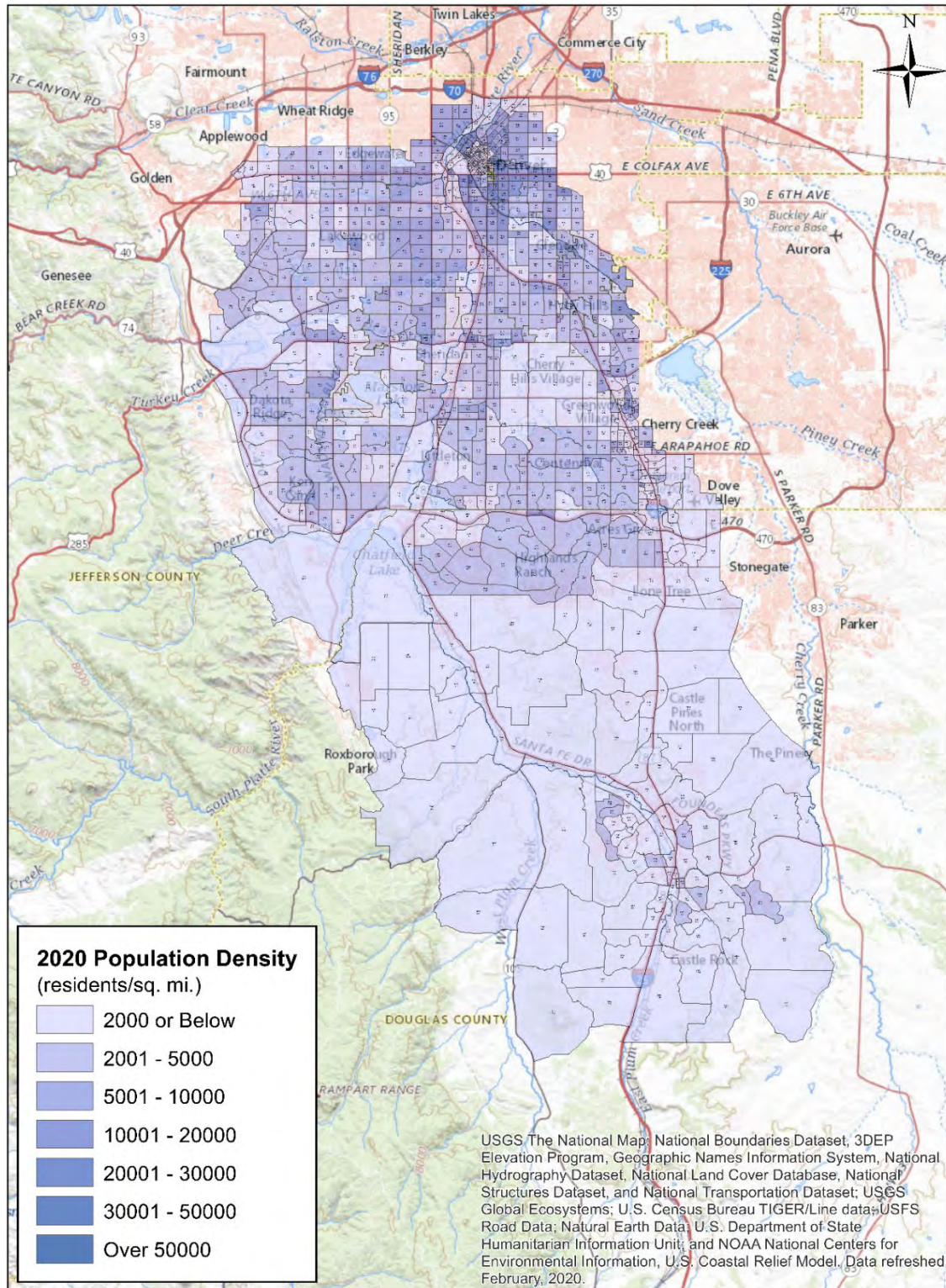


Figure 25. 2020 DRCOG Model Employment Density

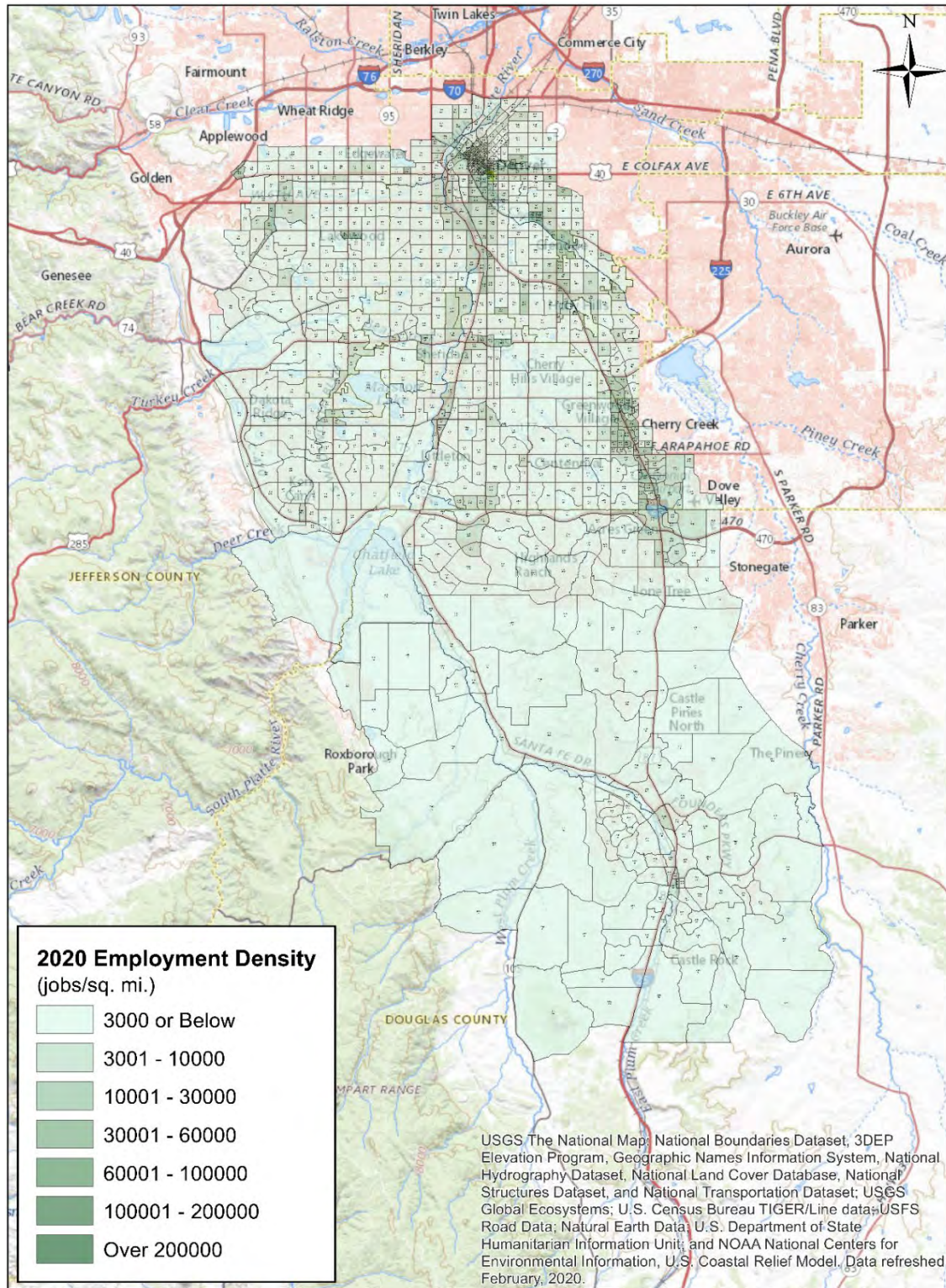


Figure 26. 2040 DRCOG Model Population Density

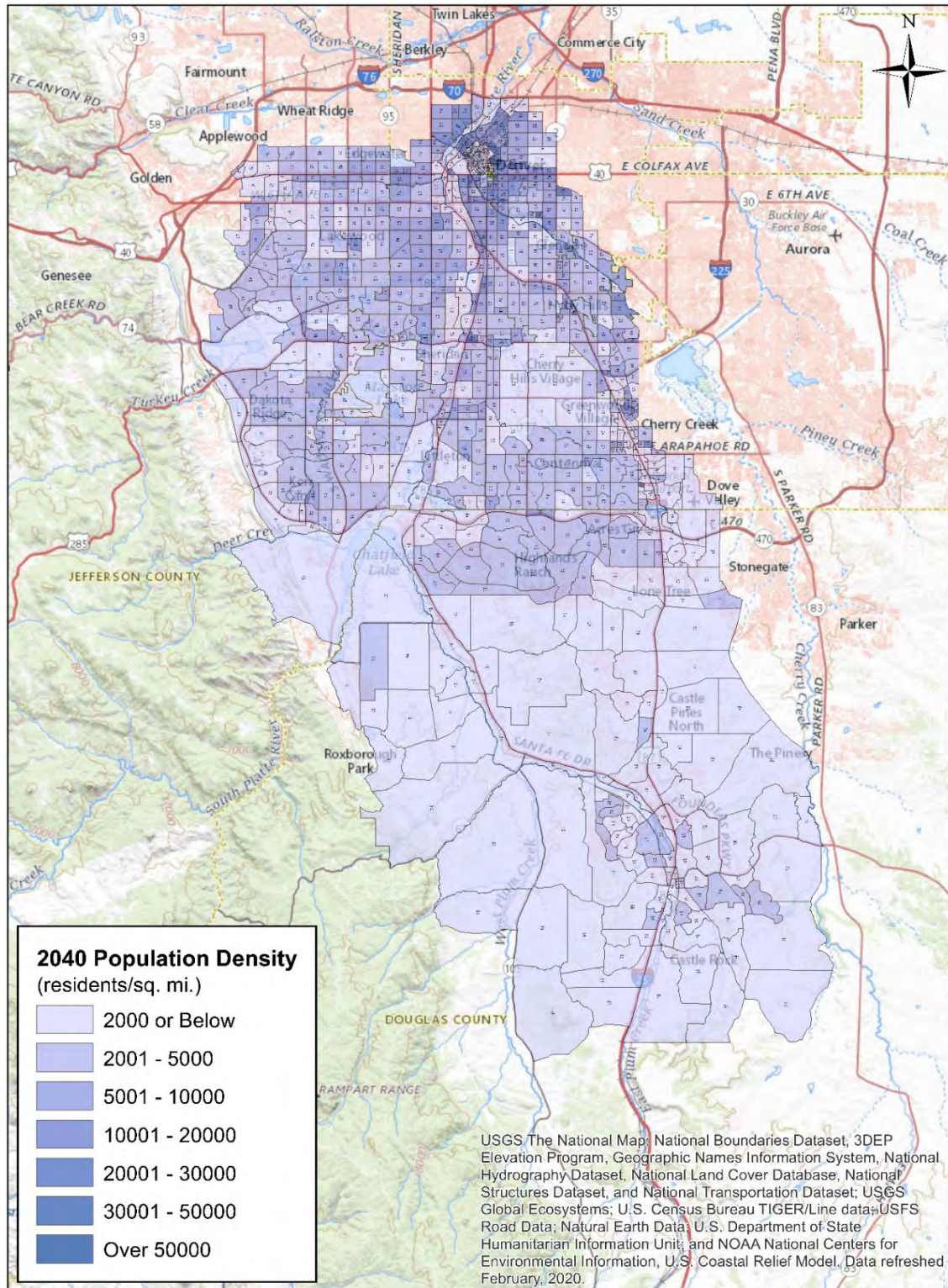
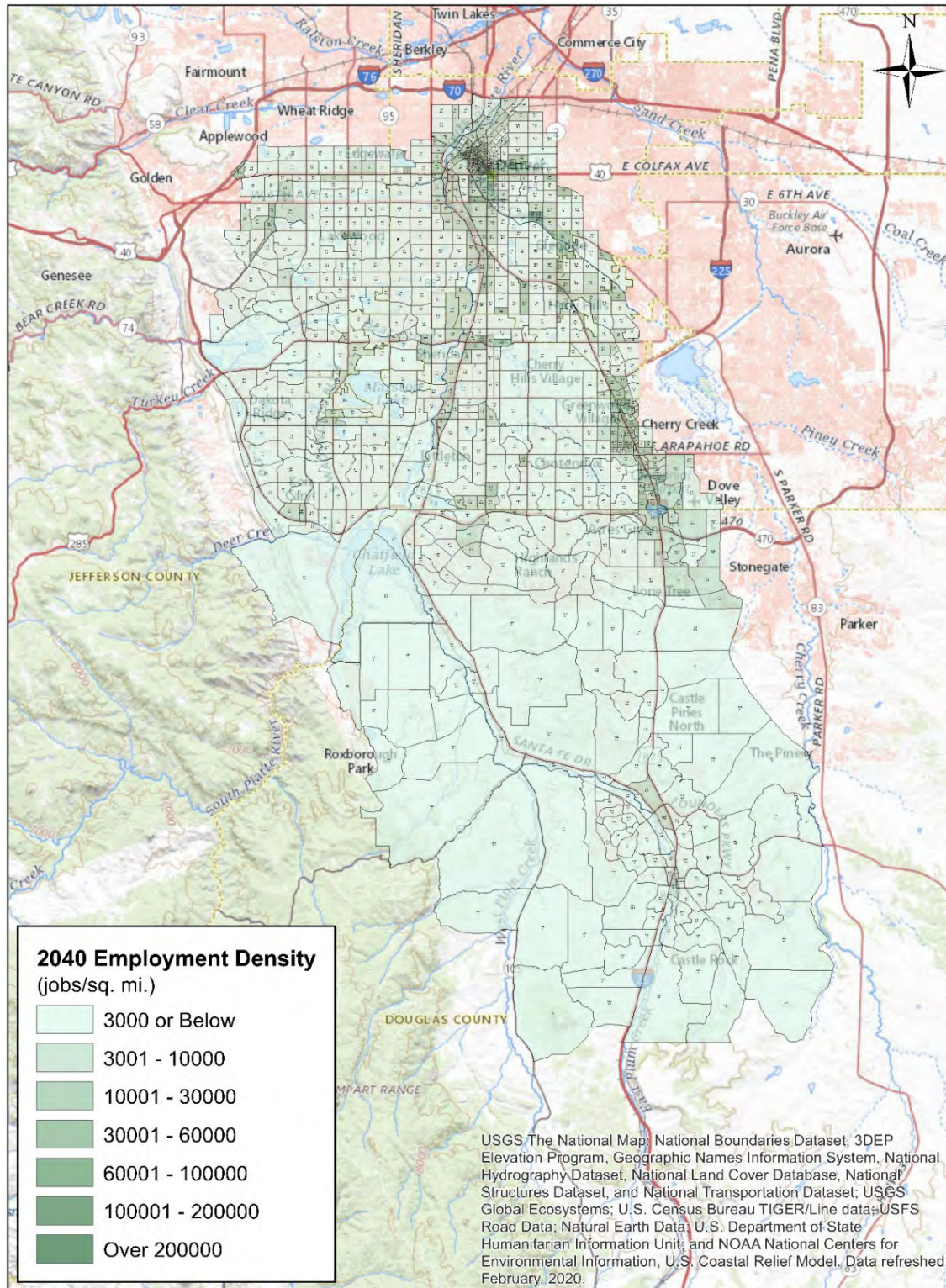
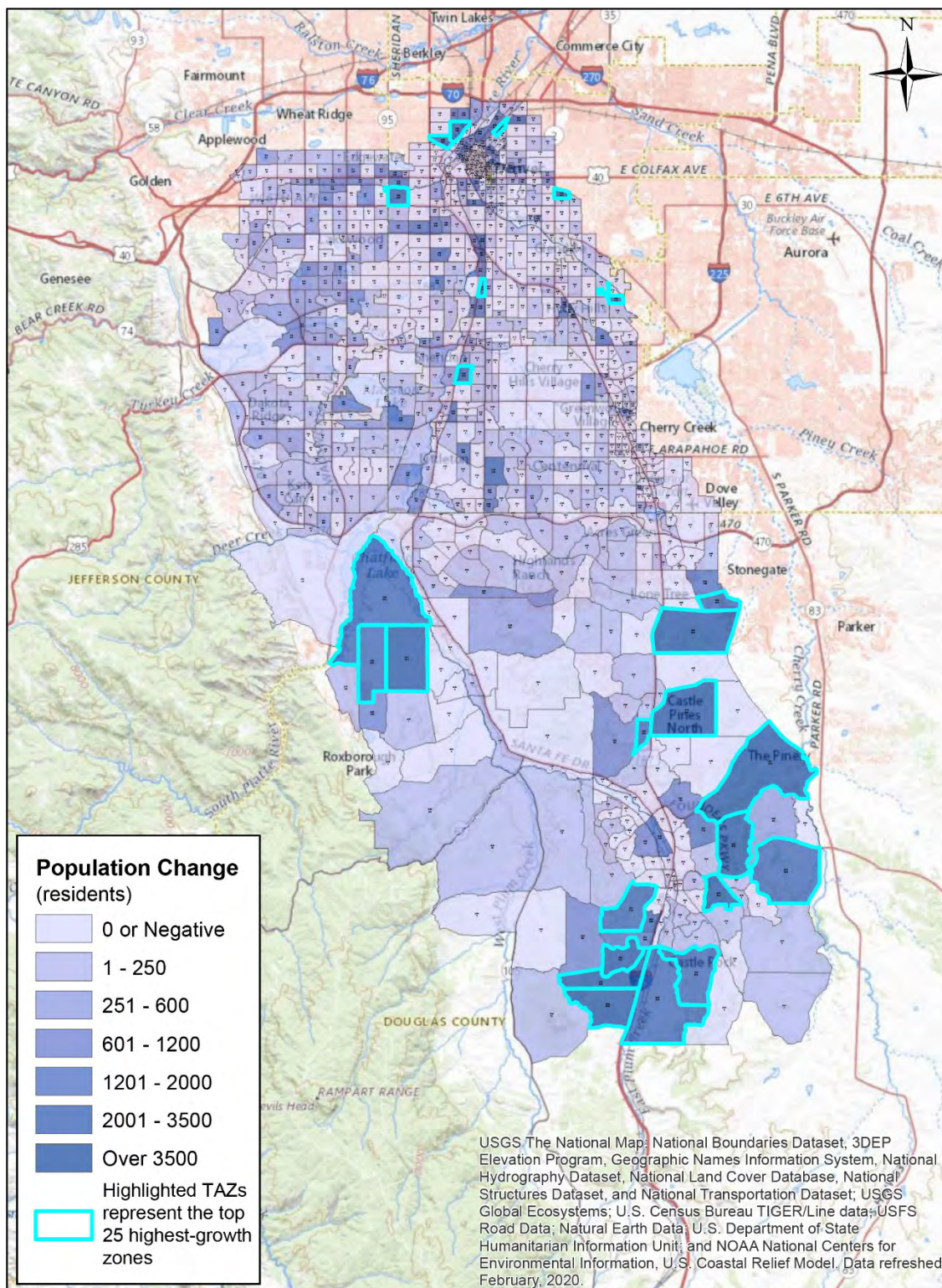


Figure 27. 2040 DRCOG Model Employment Density



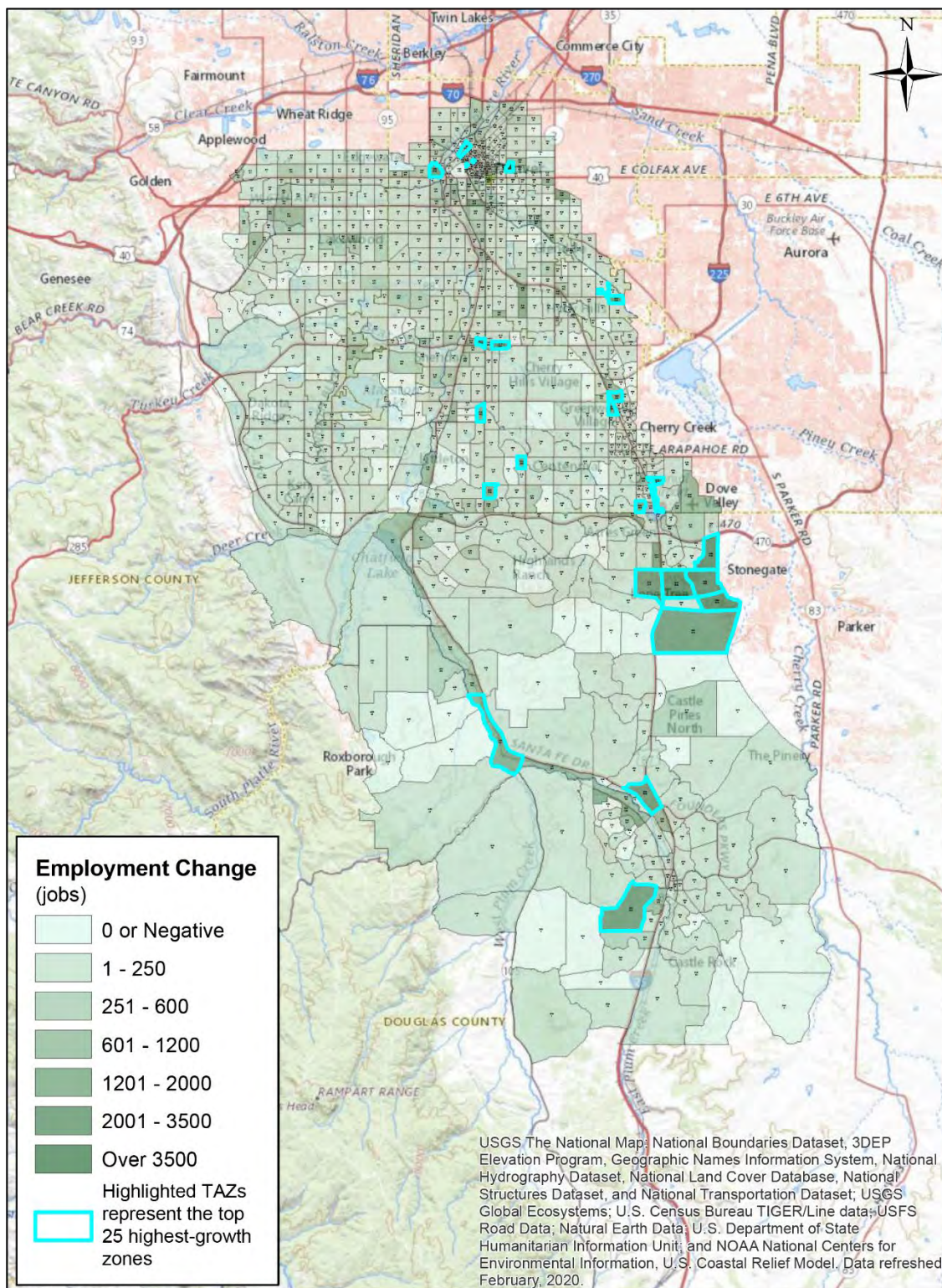
Note: Top labels represent TAZ number; bottom labels represent number of jobs.

Figure 28. 2020-2040 Change in Population



Note: Highlighted TAZs represent the top 25 highest-growth zones, measured by change in number of residents.

Figure 29. 2020-2040 Change in Employment



Note: Highlighted TAZs represent the top 25 highest-growth zones, measured by change in number of jobs.

4.1.2 Data Analysis

4.1.2.1 Population

Population data for the 25 highest-growth TAZs were determined based on the absolute difference between the 2040 and 2020 population figures. Major growth areas that are likely to generate trips along the corridor are summarized as follows:

- **Denver Area (North).** High-growth TAZs in the Denver Villa Park and Highland neighborhoods may generate trips that utilize the corridor, particularly when the I-25 corridor is congested or an incident occurs. An increase of approximately 7,100 residents is expected in the three zones.
- **Platte/Englewood Area (Central).** Two high-growth neighborhoods (Overland and Southwest Englewood) are located along the northern half of the Santa Fe Drive corridor. A large percentage of trips from these areas is likely to use the corridor, and approximately 5,200 residents are expected to be added by 2040.
- **Sterling Ranch Area (Southwest).** Sterling Ranch is a large development underway along Santa Fe Drive south of Chatfield State Park and west of Santa Fe Drive. TAZs in this immediate area are expected to see an overall increase of approximately 11,000 residents by 2040.
- **Castle Rock Area (South).** Multiple high-growth zones on the south side of Castle Rock were considered as potential trip generators for the corridor. Though these TAZs are 15 miles south of the study segment of Santa Fe Drive, they may induce regional trips, particularly when the I-25 corridor is congested or an incident occurs. By 2040, this area is expected to see an increase of over 19,000 residents.

4.1.2.2 Employment

Employment data for the 25 highest-growth TAZs (in terms of jobs) were determined based on the absolute difference between the 2040 and 2020 employment job figures. Major growth areas that would likely produce trips along the Santa Fe Drive corridor are summarized as follows:

- **Denver Area (North).** High-growth TAZs including the Sun Valley and Union Station neighborhoods may generate trips that utilize Santa Fe Drive, particularly when I-25 is congested. Approximately 8,700 jobs are expected to be added by 2040.
- **Englewood Area (Central).** High-growth zones are located around the Swedish Medical Center, Englewood. These zones are likely to produce a large number of trips along the corridor, with approximately 6,400 jobs expected to be added by 2040.
- **Castle Rock Area (South).** High-growth zones at the Outlets at Castle Rock, north Twin Oaks, and Sedalia, were considered as potential trip generators for the corridor. Though these are more than 10 miles south of the corridor, they may generate regional trips, particularly when the I-25 corridor is congested or an incident occurs. By 2040, approximately 7,400 jobs are expected to be added.

4.2 Existing Traffic Volumes

Various public and private entities collect traffic count data along roadways and at intersections, and over a range of time periods. This data helps to identify travel patterns by providing information on how many users are traveling, what type of travel mode is used, and when trips are made.

Santa Fe Drive is used by various modes of motorized vehicle, including automobiles, motorcycles, buses, and trucks (commercial freight). As a regional corridor with a broad variety of local land uses, trips related to commuting, shopping, recreation, freight distribution, and business travel all occur on the corridor.

The *Santa Fe PEL Study (C-470 to I-25)* is being conducted during the coronavirus disease 2019 (COVID-19) pandemic, a circumstance that has resulted in an extreme and unprecedented change in work and personal travel for the entire population as stay-at-home orders are in place. During the stay-at-home orders, travel has been extremely limited and traffic volumes and travel patterns are not at their 'normal' state. Due to this circumstance, field traffic volume data has not been collected or evaluated and, instead, historic data is being utilized as detailed below.

4.2.1 24-Hour Data

Existing daily traffic volumes and vehicle classification were obtained for 2018 from historical data contained on CDOT's COGNOS¹ and Online Transportation Information Systems platforms. Average daily traffic on Santa Fe Drive ranges between 49,000 vehicles per day and 112,000 vehicles per day, depending on the location along the corridor. In general, daily traffic is greatest in the northern part of the corridor, peaking in the W. Florida Avenue area, and gradually decreases heading south along the corridor.

Vehicular traffic on the corridor predominantly consists of automobiles throughout the day. Total daily traffic volumes, truck proportions, and truck volumes, are illustrated in Figure 30 through Figure 32 and Table 11. The data shows that trucks make up between 7.5 percent and 9.2 percent of vehicular traffic throughout the length of the corridor, with an average weighted truck percentage for the complete Santa Fe Drive corridor of 8.1 percent. This truck proportion is greater than other parallel routes, such as Federal Boulevard (4.0 percent), Wadsworth Boulevard (2.5 percent), and I-25 (6.0 percent). The observed volume of bus traffic is negligible, with no bus routes using the corridor north of W. Mineral Avenue.

The directional split of daily traffic volume is generally well balanced, with marginally higher southbound traffic volumes in the southern half of the corridor, and marginally higher northbound traffic volume in the north half of the corridor, as indicated in Figure 33. During the morning and evening peak periods, directional volumes reflect the commuter characteristics of the corridor, with higher volumes northbound during the AM peak period and southbound during the PM peak period, through the length of the corridor.

¹ A CDOT software system that uses Intelligent Transportation System devices to compute prevailing speeds.

Figure 30. Total Daily Santa Fe Drive Traffic and Truck Volumes (North)

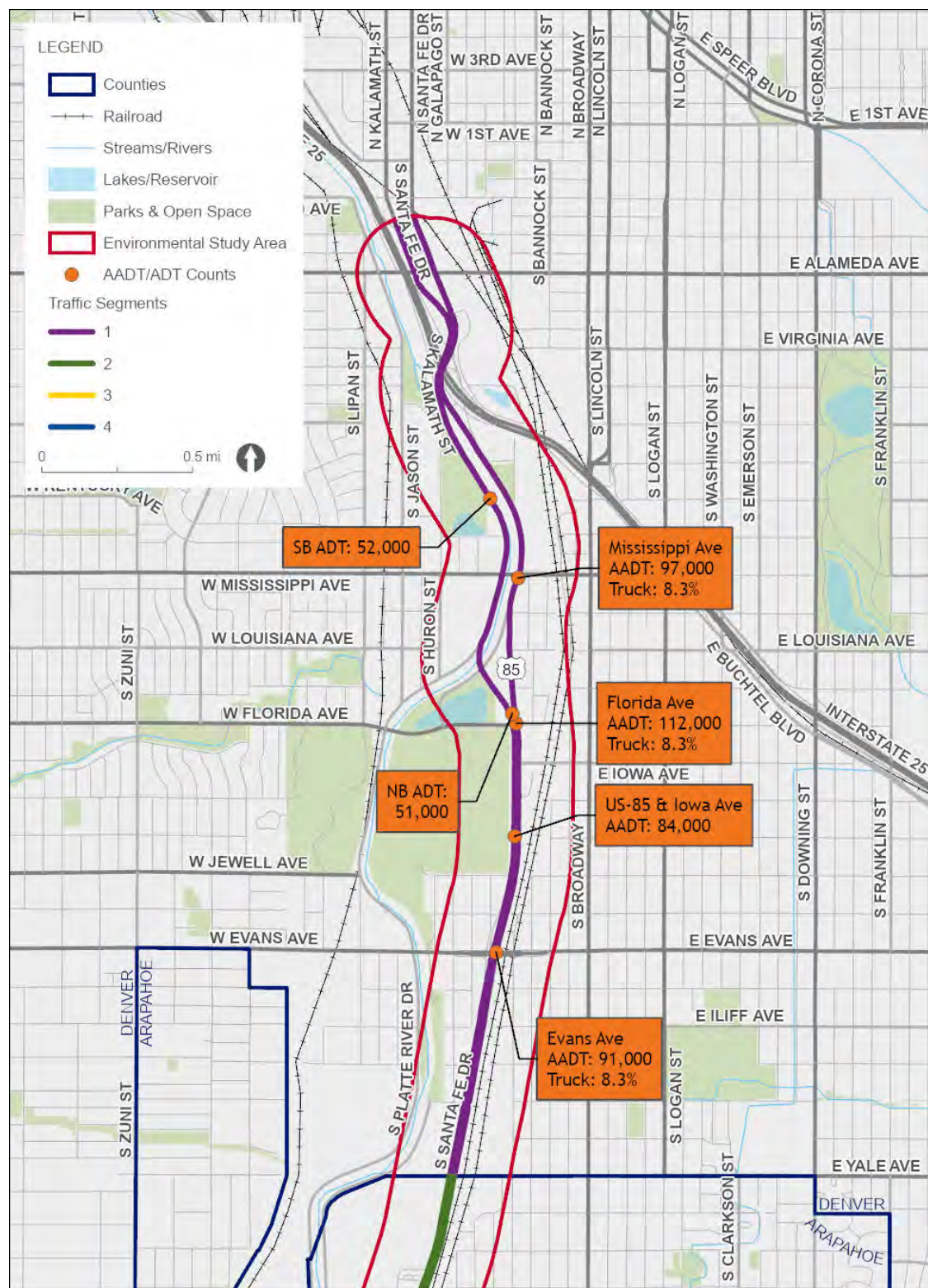


Figure 31. Total Daily Santa Fe Drive Traffic and Truck Volumes (Mid)

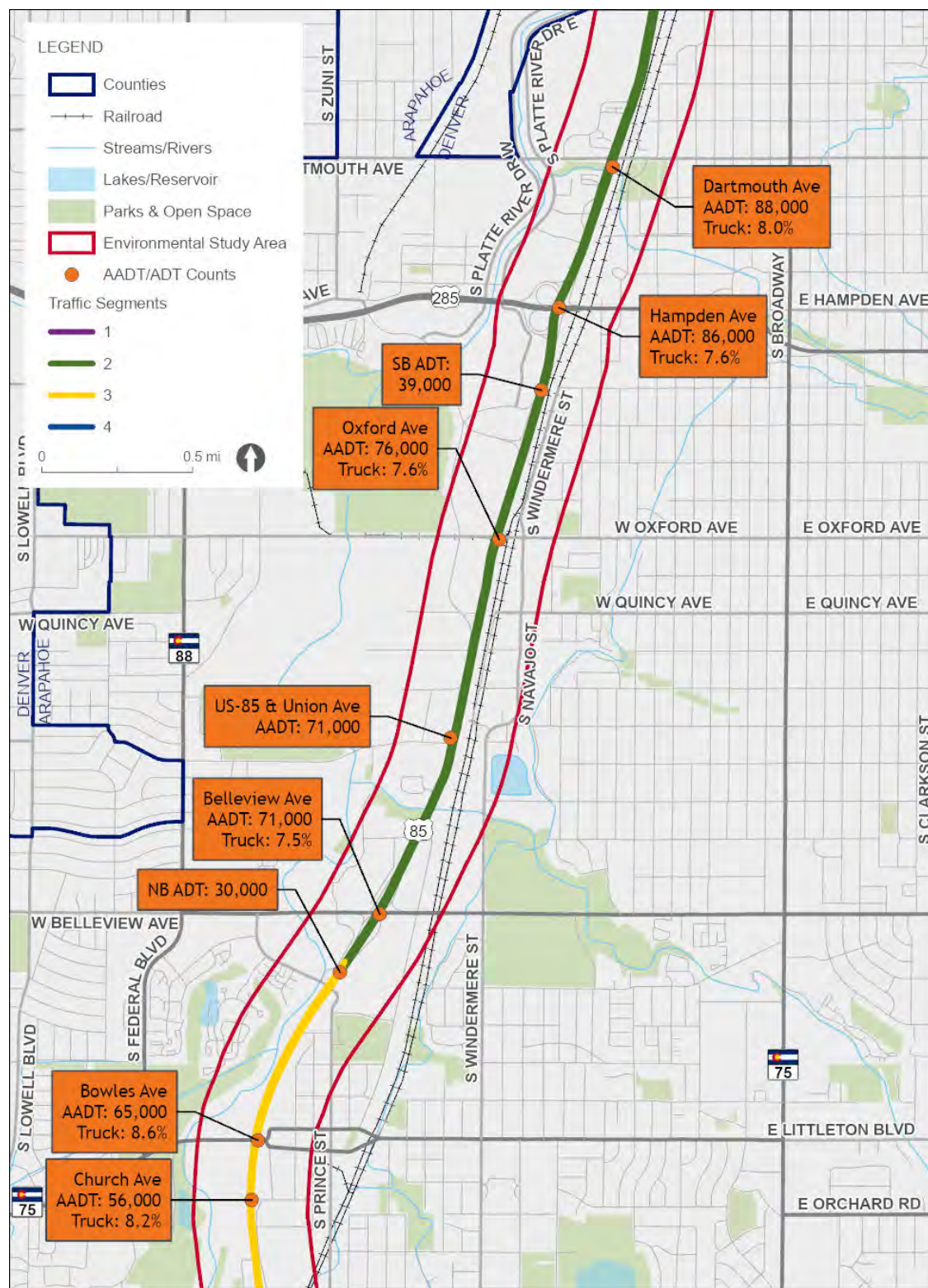


Figure 32. Total Daily Santa Fe Drive Traffic and Truck Volumes (South)

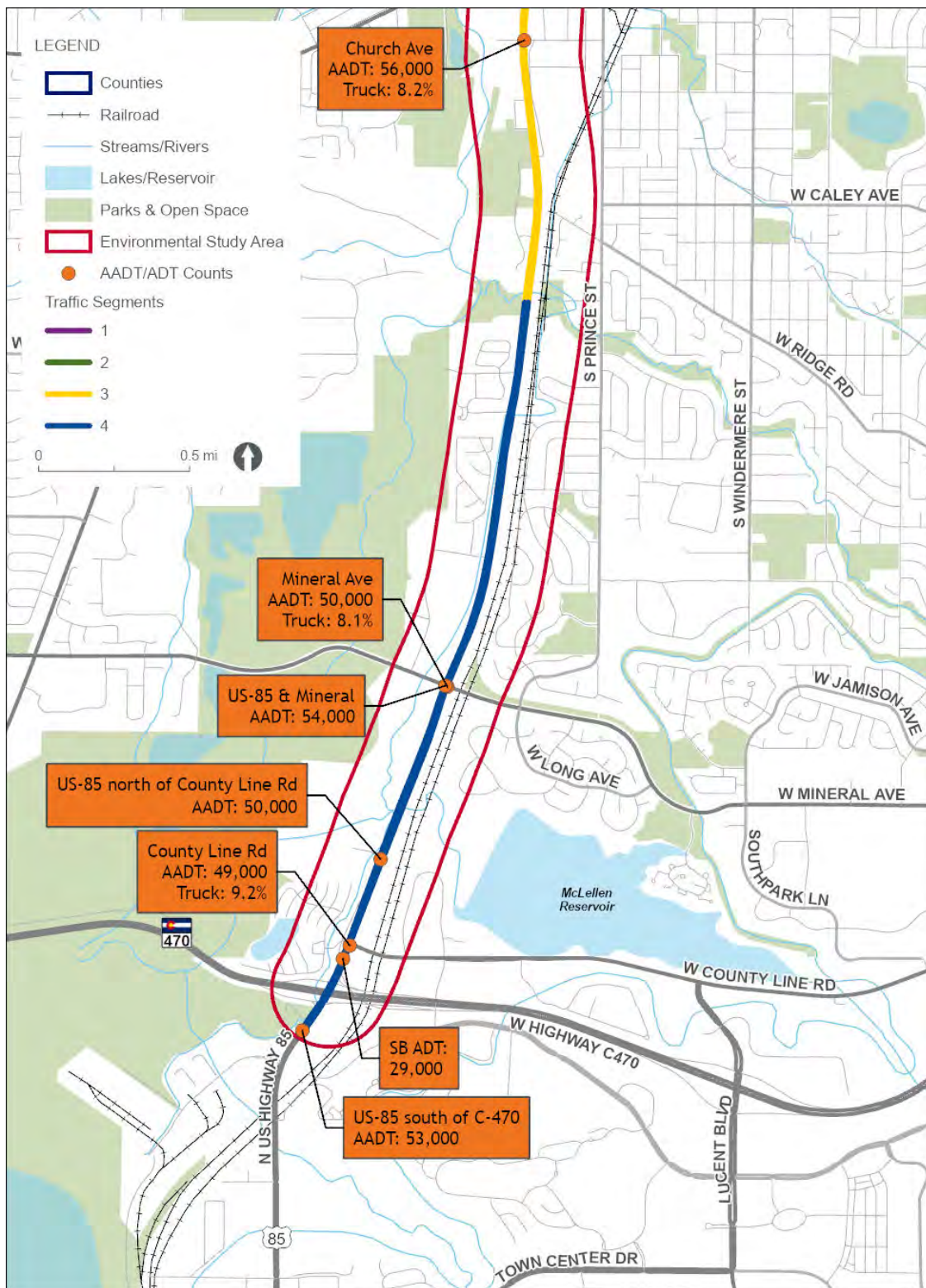
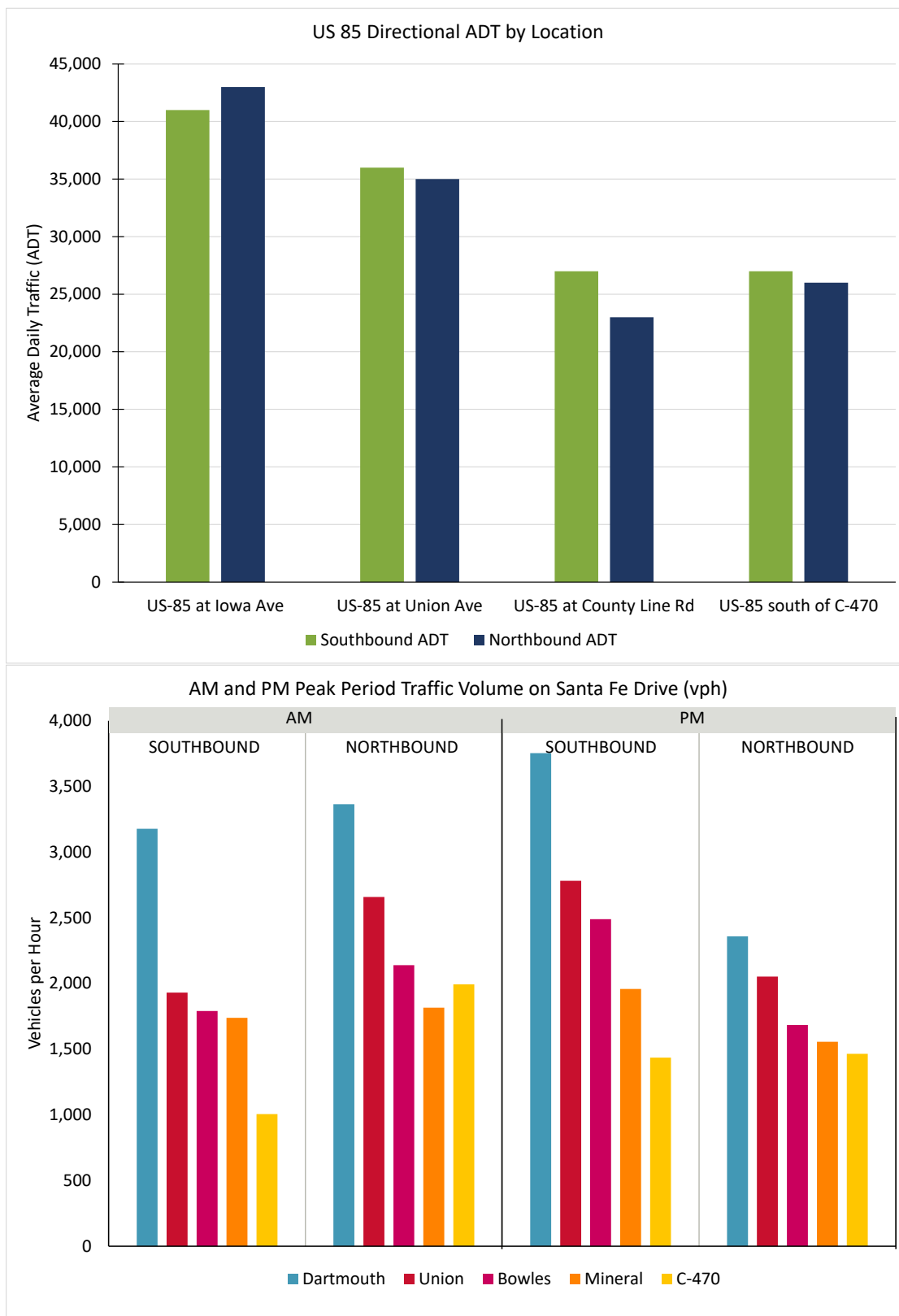


Table 11. Total Daily Traffic Volumes, Truck Proportions, and Truck Volumes

Location	Average Daily Traffic	Average Daily Truck Volume (Percentage of ADT)
Santa Fe Drive north of W. Mississippi Avenue	97,000	8,000 (8.3%)
Santa Fe Drive north of W. Florida Avenue	112,000	9,300 (8.3%)
Santa Fe Drive north of W. Evans Avenue	91,000	7,500 (8.3%)
Santa Fe Drive north of W. Dartmouth Avenue	88,000	7,000 (8.0%)
Santa Fe Drive north of US 285 (W. Hampden Avenue)	86,000	6,500 (7.6%)
Santa Fe Drive north of W. Oxford Avenue	76,000	5,800 (7.6%)
Santa Fe Drive north of W. Belleview Avenue	71,000	5,300 (7.5%)
Santa Fe Drive north of W. Bowles Avenue	65,000	5,600 (8.6%)
Santa Fe Drive north of W. Church Avenue	56,000	4,600 (8.2%)
Santa Fe Drive north of W. Mineral Avenue	53,000	4,000 (8.1%)
Santa Fe Drive north of W. County Line Road	49,000	4,500 (9.2%)
Average Weighted Truck Percentage		8.1%

Figure 33. Directional Split of 2016 Daily (Top) and Peak Period Traffic Volume



4.2.2 Turning Movement Count Data

Turning movement counts (TMC) at intersections are generally collected during peak travel hours. An AM peak hour of 8:00 AM to 9:00 AM and PM peak hour of 5:00 PM to 6:00 PM were identified from available CDOT traffic volume data. For the purposes of reviewing traffic and operations conditions, the corridor was divided into four segments north to south based on traffic volume, land use, and roadway characteristics, as illustrated in Figure 30 through Figure 32. Figure 34 through Figure 37 provide a summary of available AM and PM peak hour TMC data within Segments 2, 3, and 4 for the year 2016. No existing TMC data was identified for intersections north of W. Dartmouth Avenue.

As noted in Section 4.2 *Existing Traffic Volumes*, the *Santa Fe PEL Study (C-470 to I-25)* is being conducted during the COVID-19 pandemic, and due to this circumstance, field traffic volume data for intersection turn movements have not been collected or evaluated. Instead, exclusively historic data was utilized.

Figure 34. 2016 AM and PM Peak Hour Turning Movement Count—Segments 2, 3, and 4

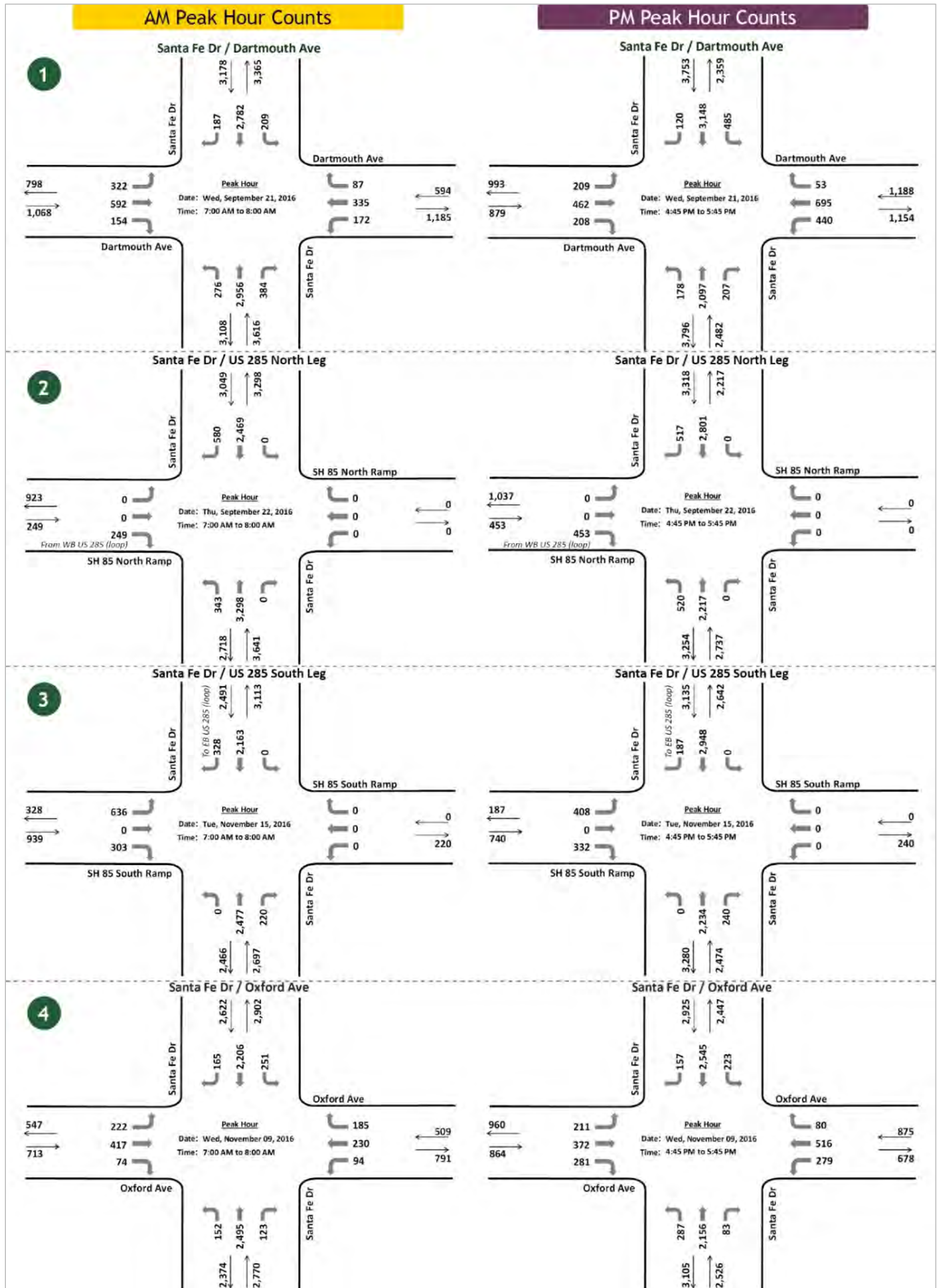


Figure 35. 2016 AM and PM Peak Hour Turning Movement Count—Segments 2, 3, and 4

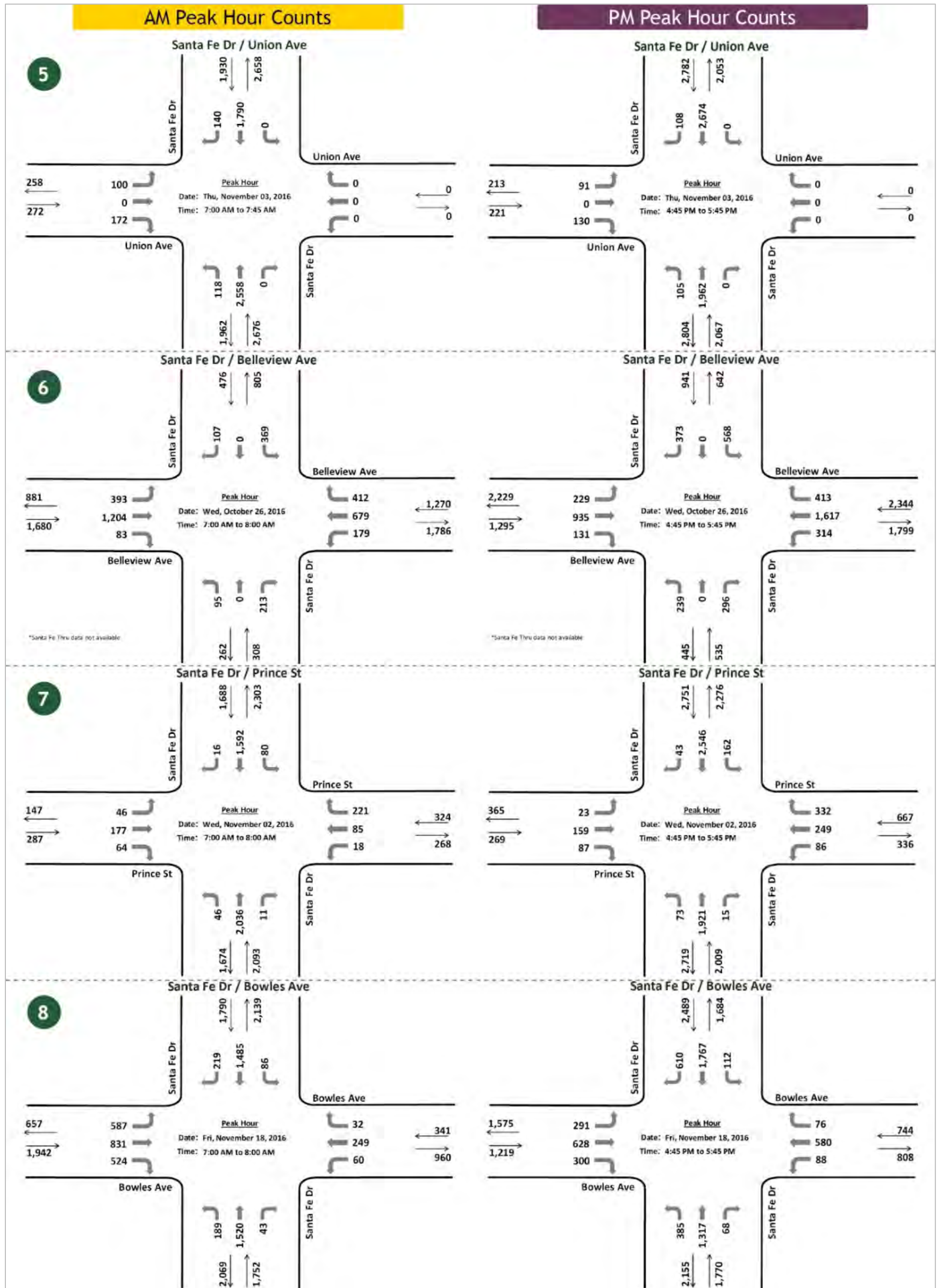


Figure 36. 2016 AM and PM Peak Hour Turning Movement Count—Segments 2, 3, and 4

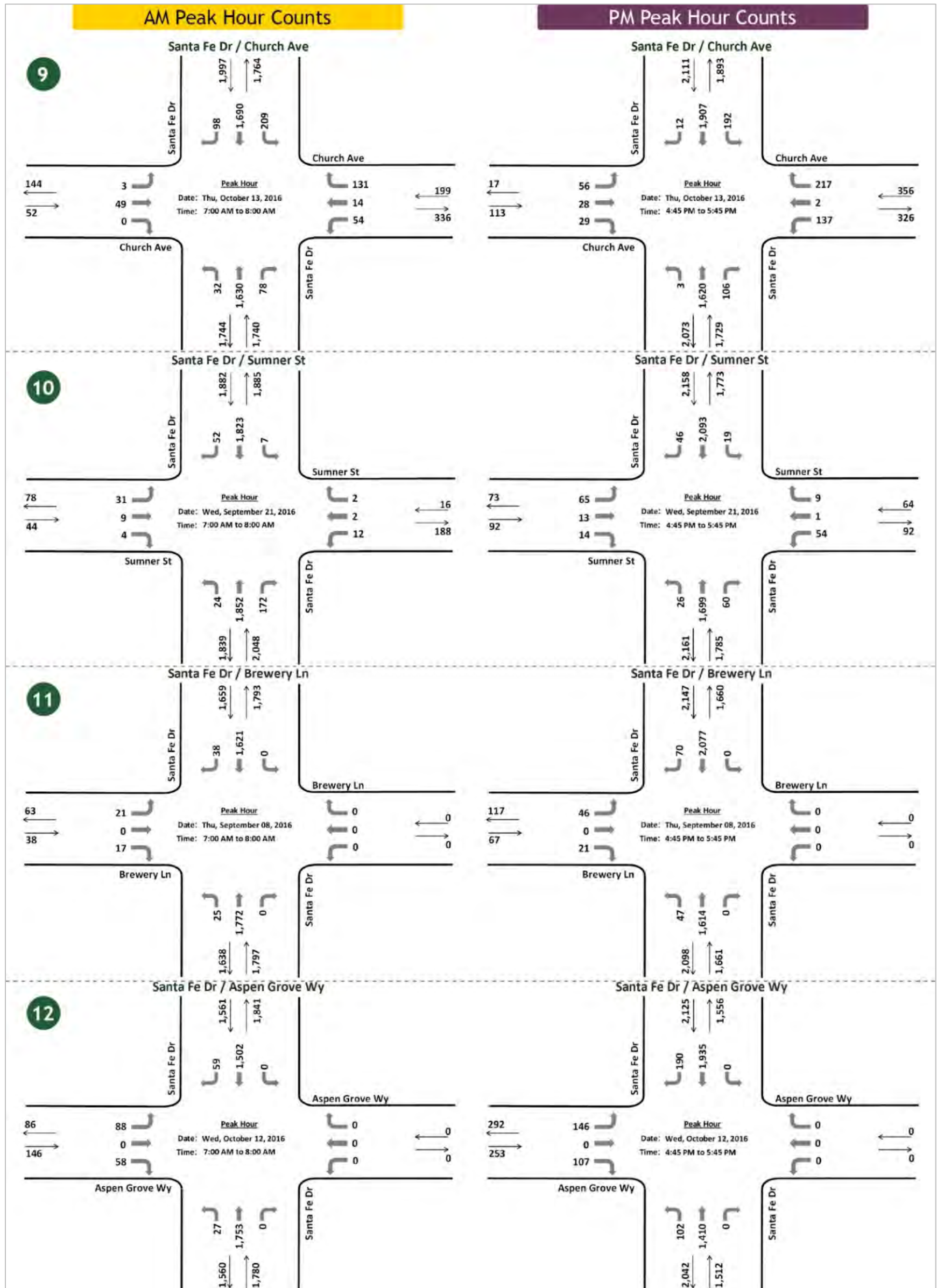
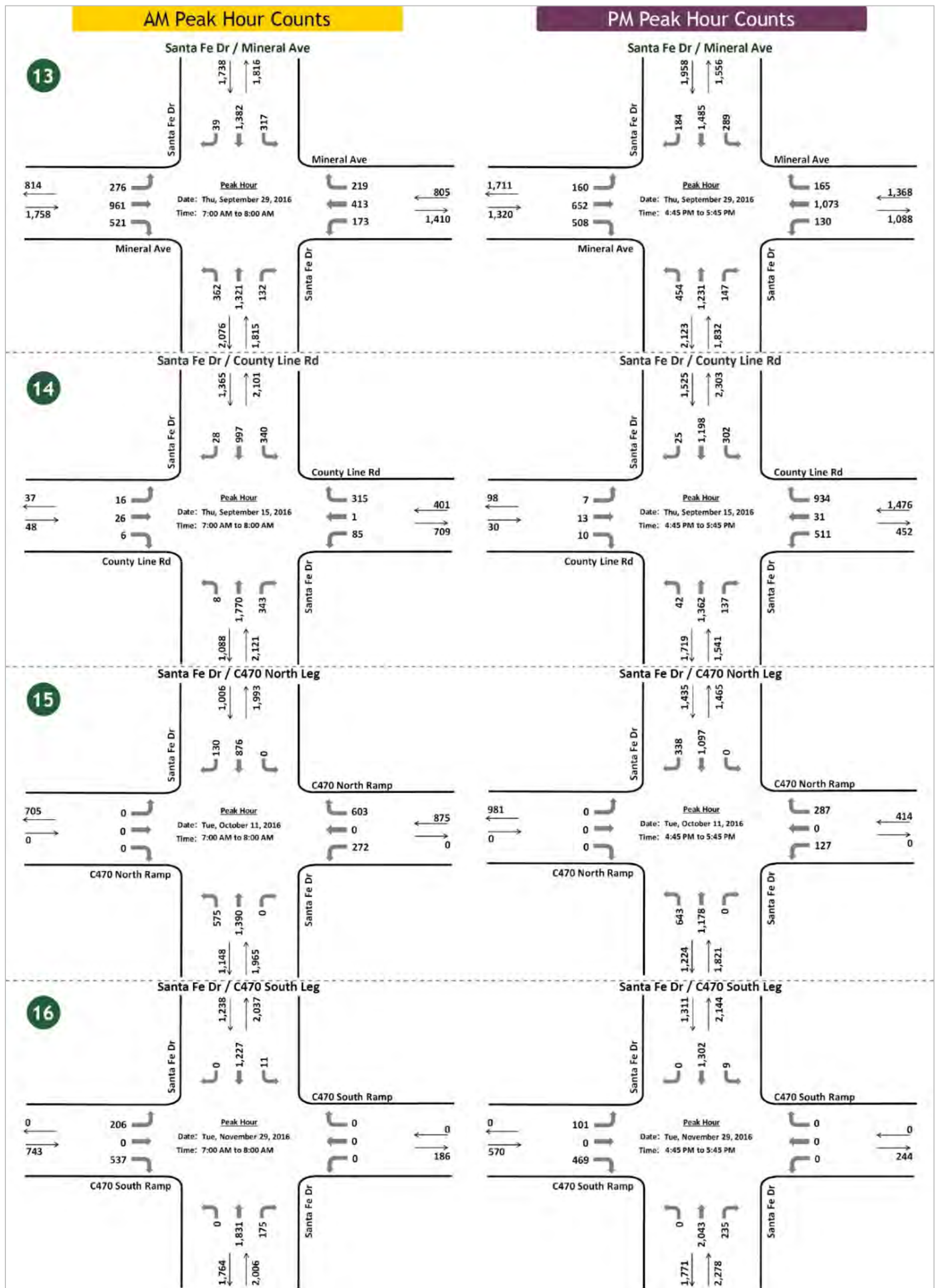


Figure 37. 2016 AM and PM Peak Hour Turning Movement Count—Segments 2, 3, and 4



4.3 Commuter/Traveler Characteristics

4.3.1 Vehicle Occupancy

The *US 85-Santa Fe Drive Corridor High-Occupancy Vehicle (HOV) Lane Assessment* (CDOT, 2013) was completed by CDOT Region 1 Traffic Operations, assessing HOV lanes on Santa Fe Drive. This, along with the *2016 Average Vehicle Occupancy Study* (CDOT, 2016a) completed for CDOT by Colorado State University, which includes general vehicle occupancy within CDOT Region 1, was used to estimate Santa Fe Drive corridor average vehicle occupancy (AVO) for the existing condition.

The primary travel direction in the AM peak hour is northbound, and southbound during the PM peak hour. Data provided in the HOV Lane Assessment for the Santa Fe corridor was aggregated and averaged to reveal an overall AVO rate of 1.8 passengers per vehicle in the HOV lane during the peak hour and in the peak direction.

The 2016 Average Vehicle Occupancy Study provides estimates of AVO for observation sites identified as representative of the regions and road classifications throughout Colorado. Based on the Average Vehicle Occupancy for Principal Arterials—Freeways and Expressways within Region 1 from this previous study—the AVO for general purpose lanes along the corridor is estimated to be 1.21 passengers per vehicle.

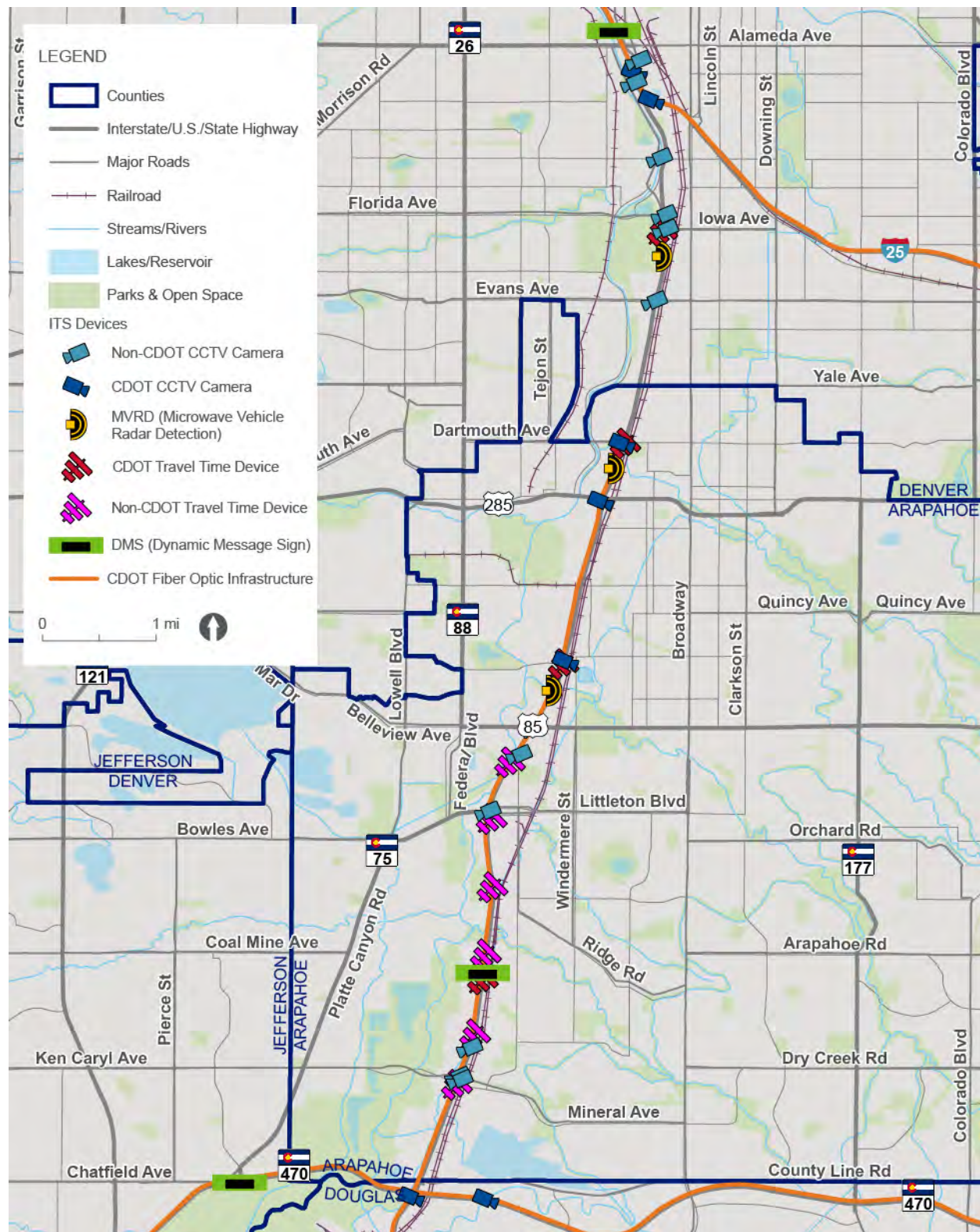
4.4 Intelligent Transportation Systems and Technology

Intelligent Transportation Systems (ITS) integrate advanced electronic communications technologies into the field of transportation; and the use of ITS technologies has emerged as an increasingly effective means of advancing safety, mobility, and reliability of the transportation network. Various ITS technologies are utilized along the Santa Fe Drive corridor to monitor and communicate roadway and traffic conditions. The type and location of existing devices and infrastructure is summarized in Table 12 and Figure 38.

Table 12. Summary of Existing ITS Devices

Device	Quantity
CDOT Closed Circuit Television Cameras	8
Non-CDOT Closed Circuit Television Cameras	9
CDOT Microwave Vehicle Radar Detectors (COGNOS)	3
CDOT Travel Time Indicators	4
Littleton Acyclica Travel Time Devices	6
CDOT Dynamic Message Signs	1
Fiber Optic Communications Backbone (W. Blakeland Drive to W. Dartmouth Avenue)	1

Figure 38. Santa Fe Drive ITS Devices



4.4.1 Closed Circuit Television Cameras

Closed-circuit television (CCTV) cameras provide 360-degree real-time video, which can be monitored to identify traffic conditions and incidents along the highway. This information can be used to effectively dispatch an incident response team, and can be relayed to motorists through dynamic signage and other means. Assuming there are no obstructions to CCTV camera line-of-sight, or significant roadway curvature, cameras may be placed a maximum of 1.5 miles apart and maintain complete corridor coverage.

There are six CDOT-owned CCTV cameras either along the corridor, or close enough that they can be used to monitor the corridor. CDOT CCTV coverage is limited in Segment 1 (north of W. Dartmouth Avenue) and Segments 3 and 4 (between W. Belleview Avenue and C-470); however, 11 local agency CCTV cameras are deployed in these areas at traffic signals maintained by City and County of Denver and the City of Littleton. One camera, at Aspen Grove Way, is currently non-functioning. When considering both CDOT and non-CDOT cameras, the maximum camera spacing along the corridor is roughly 1.5 miles, suggesting reasonable corridor coverage, excepting topographic, alignment, or other obstructions.

4.4.2 Microwave Vehicle Radar Detectors

Microwave vehicle radar detectors can report per lane traffic volumes, speed, vehicle classification, and occupancy at a fixed location across multiple lanes of two-way traffic. Three microwave vehicle radar detectors devices are currently deployed in the northern segments of the Santa Fe Drive corridor, with the southernmost device located 4.5 miles north of the C-470 interchange.

4.4.3 Travel Time Devices

Roadside antennas record CDOT Express Lane transponder signals to calculate travel time. This technology is becoming obsolete and is being phased out by CDOT; however, there are currently four CDOT travel time indicator locations on the corridor as indicated in Figure 38. The City of Littleton has six Acyclica Travel Time devices located along the corridor. This equipment identifies unique Wi-Fi MAC addresses from mobile devices and uses the associated location and timestamp data to estimate vehicular travel times.

4.4.4 Dynamic Message Signs

Dynamic Message Signs (DMS) display messages to communicate information to motorists about traffic congestion, incidents, roadwork, and special events that might impact the flow of traffic. Information gathered using various ITS devices can be relayed via DMS to inform or influence driver behavior; therefore, these devices are ideally placed upstream of important decision or route-finding points.

There is only one DMS device deployed along southbound Santa Fe Drive, roughly one mile north of W. Mineral Avenue. Immediately outside of the corridor, southbound I-25 and eastbound C-470 both have DMS devices near their respective Santa Fe Drive interchanges, as indicated in Figure 38. Although not dynamic messaging, a blank-out sign is located on

southbound Santa Fe Drive north of Brewery Lane, activated only as needed to indicate icy conditions between Brewery Lane and Aspen Grove Way.

4.4.5 Fiber Optic Communications Infrastructure

Fiber optic communication offers reliability and high-bandwidth capacity. CDOT is rapidly expanding its fiber network, which is seen as integral to safety and mobility, and to meet growing demand for emerging technologies, such as connected infrastructure and vehicles. On Santa Fe Drive, a CDOT fiber optic backbone begins south of W. Blakeland Drive and extends north to W. Dartmouth Avenue. CDOT traffic signal controllers and CCTV along the corridor communicate via this fiber backbone. Additionally, all traffic signals on Santa Fe Drive that are maintained by the City of Littleton are routed through this fiber optic network. There is a gap in CDOT fiber optic backbone on Santa Fe Drive between I-25 and W. Dartmouth Avenue, and traffic signals within these limits are maintained by the City and County of Denver. These traffic signals are connected to the City and County of Denver fiber optic network via east-west backbone on the Alameda Avenue, Mississippi Avenue, and Evans Avenue corridors.

4.4.6 Traffic Signals

There are 23 signalized intersections along the corridor, with the signals maintained by three separate agencies. Traffic signals within Denver and Littleton city limits are maintained by those respective agencies, with exceptions at W. County Line Road and the I-25 interchange. CDOT Region 1 maintains the remaining traffic signals on the corridor, including any within Englewood, Sheridan, and unincorporated Douglas County. Additionally, CDOT maintains a traffic signal at a railroad crossing south of W. Oxford Avenue for the Union Pacific Railroad. Traffic signal timing plans are periodically updated through an interagency effort led by DRCOG, with a review for the corridor between W. Dartmouth Avenue and Highlands Ranch Parkway completed in 2017, and further adjusted in 2018. The retiming evaluated cycle lengths to balance intersection capacity and user delay, with cycle lengths that range from 120 seconds to 180 seconds varying by time of day to account for fluctuating numbers of vehicles, bicyclists, and pedestrians.

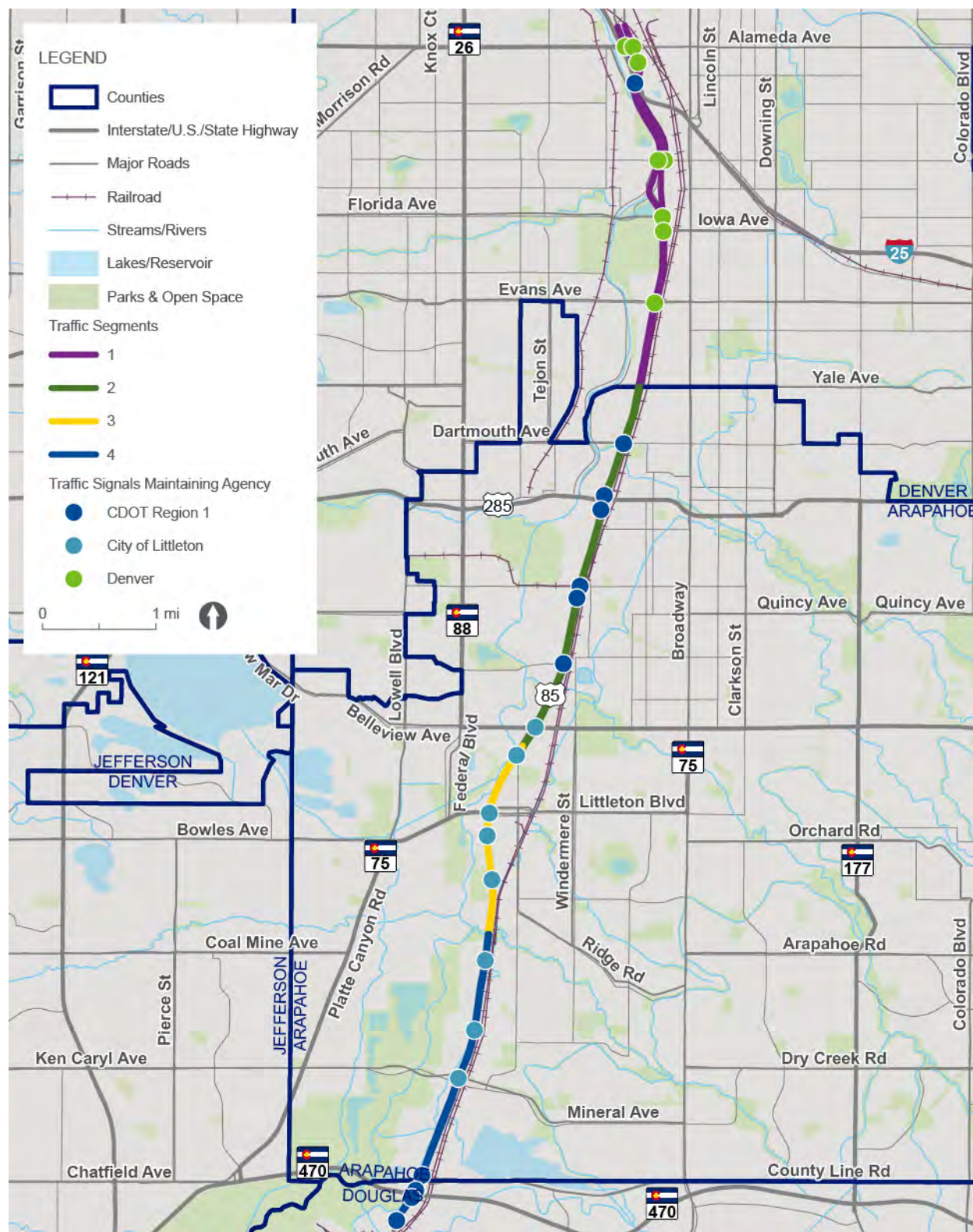
Pedestrian actuation of traffic signals creates additional delay for drivers along Santa Fe Drive and can disrupt the timing of the coordinated vehicular movements along the corridor. These impacts affect travel reliability and predictability for northbound and southbound travelers, and can increase red time for vehicles by up to a minute at the larger intersections.

Table 13 summarizes traffic signals along the corridor, and Figure 39 maps their locations.

Table 13. Summary of Existing Traffic Signals

Agency	Signalized Intersections	Other Corridor Signals
CDOT Region 1	10	1
City and County of Denver	5	0
City of Littleton	8	0
Totals	23	1

Figure 39. Santa Fe Drive Signalized Intersections



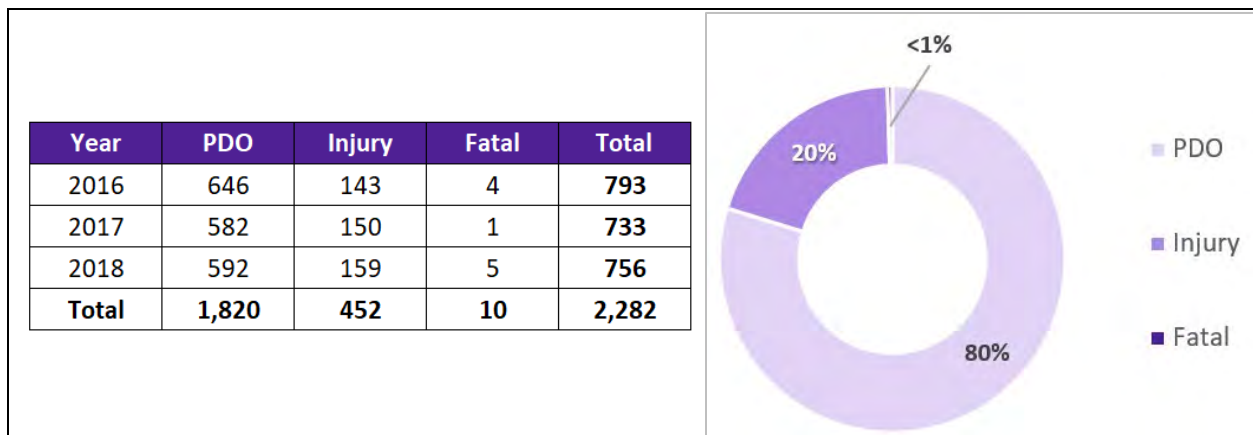
4.5 Corridor Safety

A Safety Assessment Report (CDOT, 2020c) compiled for the corridor between Santa Fe Drive Mileposts 200.30 and 210.86, summarizes a total 2,282 crashes that occurred on the corridor during the three-year period of January 1, 2016, to December 31, 2018. An average 761 crashes occur per year on the corridor, and that annual average is generally consistent through the three-year analysis period. An additional report, the *Safety Analysis and Recommendation Report*, was compiled to review CDOT's Safety Assessment Report and further investigate segment and intersection crash trends to provide safety recommendations for inclusion in the PEL Study. The *Safety Analysis and Recommendations Report* is located in Appendix H.

4.5.1 Crashes by Type

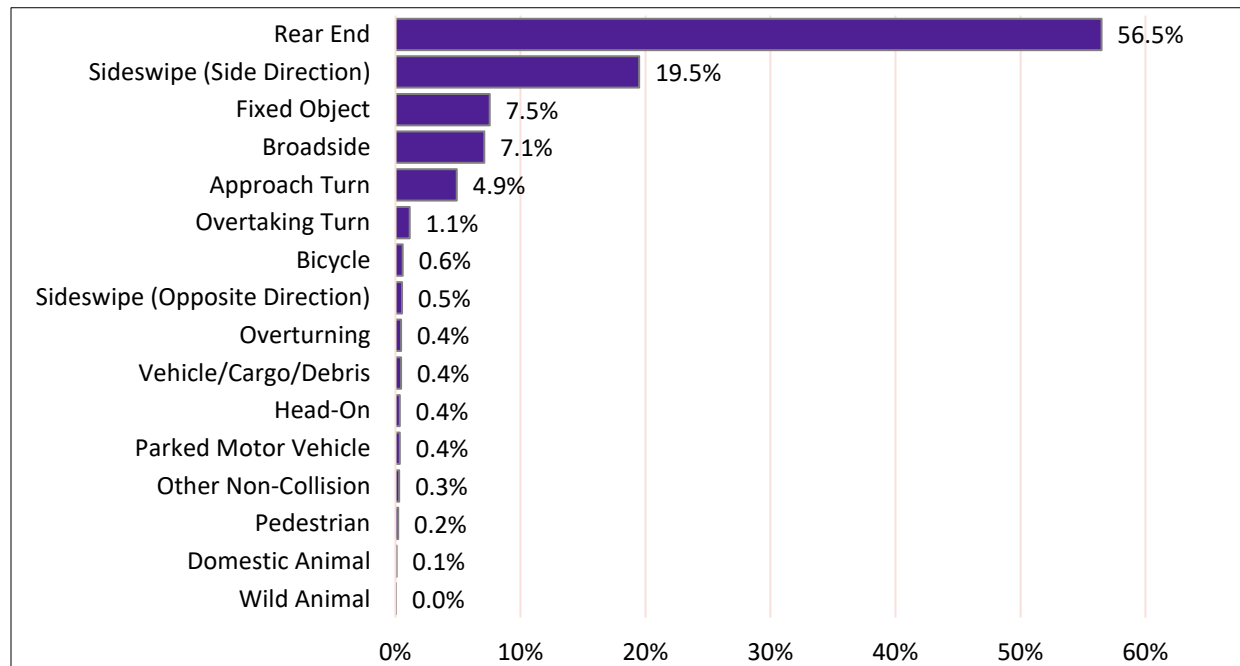
As shown in Figure 40, 80 percent of crashes resulted in property damage only (PDO), 20 percent were injury crashes, and less than 1 percent were fatal crashes.

Figure 40. Crash Injury Severity, 2016 to 2018



The *Safety Analysis and Recommendations Report* (Appendix H) identifies rear-end collisions as the most common crash type, accounting for 56.5 percent of all corridor crashes reported during the three-year analysis period. Other common crash types include same direction sideswipe crashes (19.5 percent) and fixed object crashes (7.5 percent). The reported crash types are shown in Figure 41, and would be considered typical of a congested urban arterial corridor.

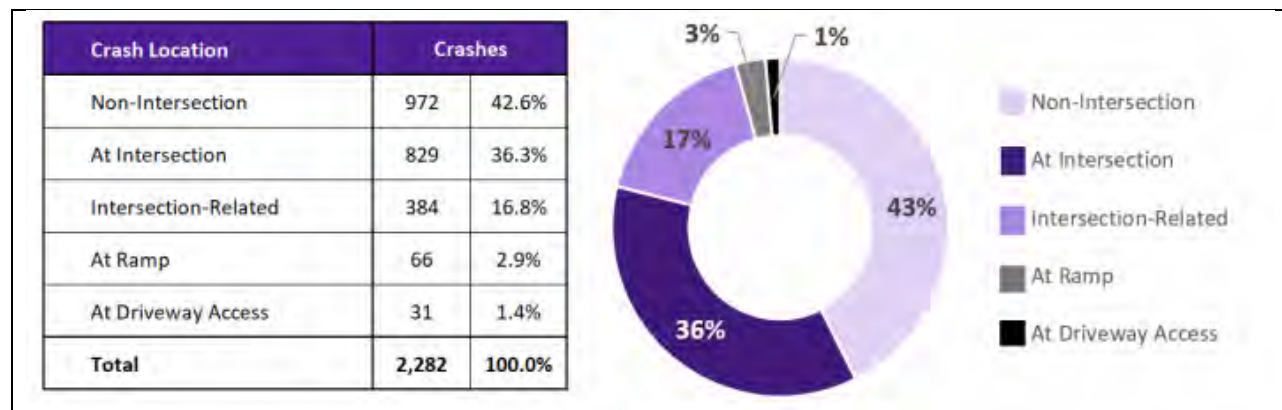
Figure 41. Crashes by Crash Type, 2016 to 2018



4.5.2 Crashes by Location

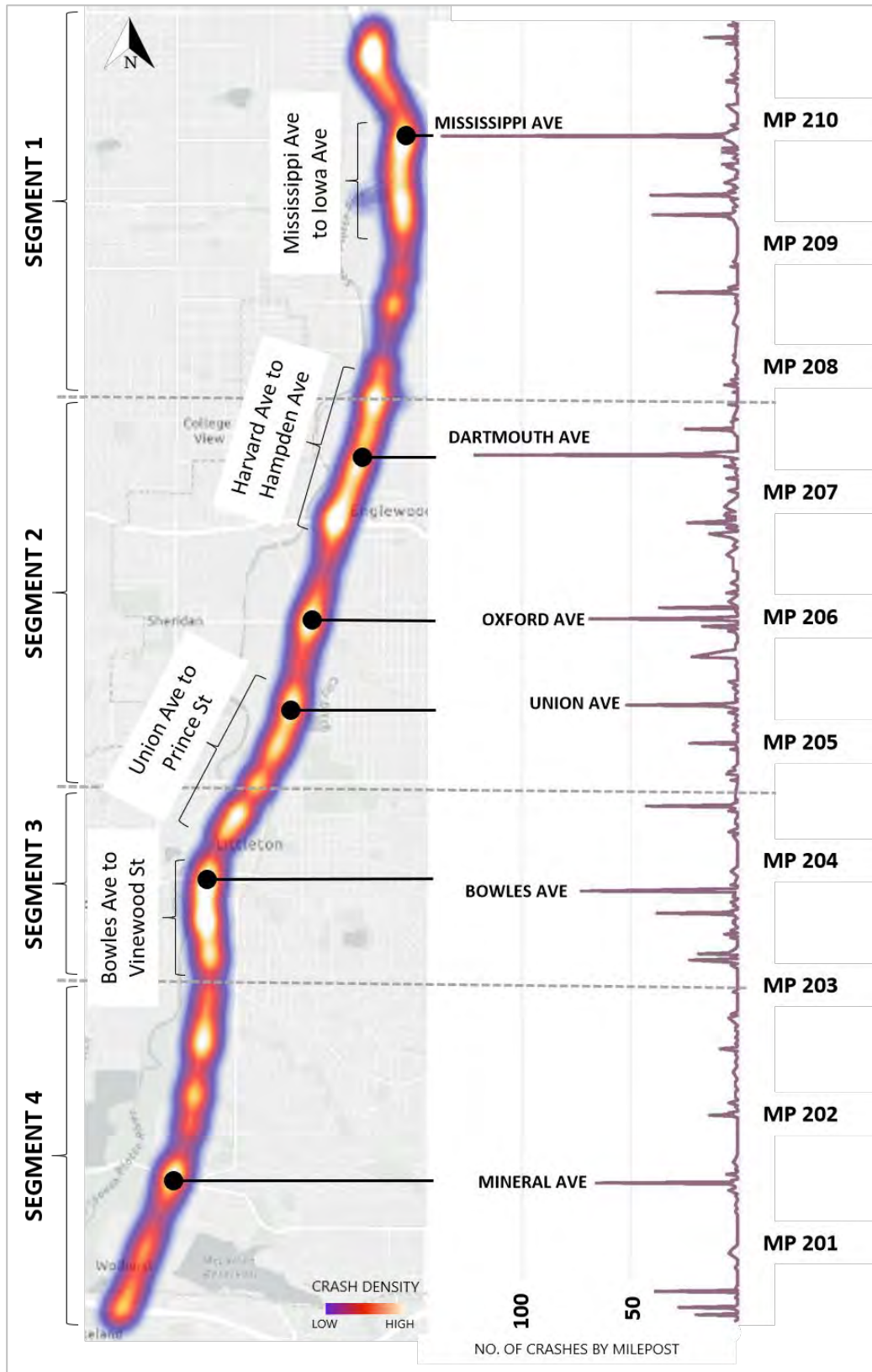
Of the 2,282 crashes reported during the three-year analysis period, 43 percent of crashes occurred at non-intersection locations, 36 percent of crashes occurred at or near intersections, 3 percent of crashes occurred at interchange ramps, and 1 percent of crashes occurred at driveway access points, as summarized in Figure 42.

Figure 42. Corridor Crashes by Location



A spatial review of crashes for the entire corridor is illustrated in Figure 43. Crash frequency is shown to peak around W. Mississippi Avenue, W. Dartmouth Avenue, W. Oxford Avenue, W. Bowles Avenue, and W. Mineral Avenue.

Figure 43. 2016-2018 Corridor Crash Frequency Map



4.5.3 Motorcyclist, Pedestrian, and Bicycle Crashes

Motorcyclists were involved in 37 crashes (1.6 percent), of which 73 percent resulted in injury (25 crashes) or fatality (2 crashes).

18 crashes (0.8 percent) involved a cyclist or pedestrian, with 50 percent of these crashes resulting in injury (7 crashes) or fatality (2 crashes). The overall low proportion of crashes involving non-motorized users reflects the car-dominant nature of the corridor. Limited pedestrian and bicycle facilities are provided along and across the corridor, with north-south pedestrian and bicycle travel facilitated by parallel adjacent facilities, such as the South Platte River Trail. The W. Mississippi Avenue intersection accounts for the highest number of pedestrian and bicycle crashes, with five crashes (28 percent).

4.5.4 Crash Analysis by Segment

Crashes were analyzed based on the segments identified in Figure 43.

4.5.4.1 Crash Rate

Crash rates describe the number of crashes compared to a measure of exposure, defined as crashes per million vehicle miles, and therefore consider the variation in traffic volumes and associated crash risk. For each segment illustrated in Figure 43 the average annual crash rate has been identified, and range between 2.27 and 3.65 crashes per million vehicle miles of travel (MVMT). As shown in Table 14, Segment 3 carries the most crash risk at 3.65 crashes per MVMT, and the lowest crash rate occurs for Segment 1 (2.27 crashes per MVMT). The crash rate on all segments is greater than that of CDOTs' most recent statewide average for a typical expressway facility, and all segments except Segment 1 have a greater crash rate than CDOTs' most recent statewide average for a typical principal arterial.

4.5.4.2 Crash Cost

Colorado uses economic person-injury unit costs from the National Safety Council's report on *Estimating the Costs of Unintentional Injuries* to identify crash cost by severity type (National Safety Council, 2020). These costs include wage and productivity losses, medical expenses, administrative expenses, motor vehicle damage, and employers' uninsured costs. The annual cost of segment crashes on the corridor is listed in Table 14. Although Segment 3 is shown to have the highest crash rate, a greater proportion of injury and fatal crashes per mile occurred in Segment 1, resulting in the greatest economic cost.

Table 14. Crash Analysis by Corridor Segment, 2016-2018

Segment	Length (mi)	Crash Severity, 2016 to 2018				Crash Rate (per MVMT)	Annual Cost of Crashes	
		PDO	Injury	Fatal	Total	Avg Annual	Full Segment	Per Mile
1	2.74	519	131	7	657	2.27	\$10,291,333	\$3,755,961
2	3.34	689	156	2	847	2.94	\$8,777,833	\$2,628,094
3	1.70	322	74	0	396	3.65	\$3,588,000	\$2,110,588
4	2.60	290	91	1	382	2.82	\$4,623,100	\$1,778,115
Corridor	10.38	1,820	452	10	2,282	2.86	\$27,280,266	\$2,628,157

PDO = property damage only; MVMT = million vehicle miles of travel

4.5.4.3 Fatal Crashes

Ten fatal crashes were reported along the Santa Fe Drive corridor during the three-year analysis period. Of the 10 fatal crashes, 7 occurred in Segment 1, 2 occurred in Segment 2, and 1 occurred in Segment 4. The locations of the fatal crashes are shown in Figure 44. Four crashes involved two motor vehicles (one of which involved a motorcyclist), four were single-vehicle crashes (one of which involved a motorcyclist), and two crashes involved a pedestrian or bicyclist.

Figure 44. Fatal Crashes, 2016-2018



4.5.4.4 Intersection Crashes

Over half of all recorded crashes occurred at or near intersections. The intersections with the highest incidence of crashes are Santa Fe Drive and W. Dartmouth Avenue (144 crashes, Segment 2), W. Mississippi Avenue (141 crashes, Segment 1), W. Bowles Avenue (80 crashes, Segment 3), W. Mineral Avenue (79 crashes, Segment 4), and W. Oxford Avenue (79 crashes, Segment 2). Intersections are dominated by rear end and sideswipe crash types that primarily occur on intersection approaches, with intersections at C-470, W. County Line Road, W. Iowa Avenue and W. Mississippi Avenue having a notable proportion of broadside and approach turn crashes.

W. Mississippi Avenue, W. Dartmouth Avenue, and W. Mineral Avenue are shown to be the top three crash cost intersections, with all three locations recording a fatal crash during the 2016 to 2018 analysis period. Crash costs are also high at W. Oxford Avenue and W. Bowles Avenue, ranked 6th and 7th on the corridor, respectively.

4.6 Travel Conditions

Traffic speed, travel time, congestion, and bottleneck data were obtained to provide a baseline for how well the corridor is operating. As detailed in the *Santa Fe PEL C-470 to I-25 Data Collection Plan (May 2020)*, this travel data was obtained from INRIX, a third-party vendor. By comparing speed and travel times of a roadway to the posted speed limit and free-flow travel times, conclusions about roadway operations can be made.

Travelers on Santa Fe Drive experience varying degrees of travel conditions depending on the time of day, day of week, and season of year. The corridor is also sensitive to the impacts of localized corridor conditions, as well as conditions on alternate regional routes. A four-month sample period of February 2019 through April 2019 was used to study travel conditions.

4.6.1 Travel Time

Travel time measures are important because a more reliable travel time can help people plan trips according to the anticipated road conditions so that they arrive at their destination on time. Unreliable or unpredictable travel times can cause significant difficulty in trip planning and can have significant economic impacts, especially for freight operators.

During the overnight hours of 8:00 p.m. through 5:00 a.m., northbound and southbound travelers generally experience free-flow conditions resulting in an average 15-minute travel time in both directions between the Santa Fe Drive interchanges with I-25 and C-470. Morning and evening peak periods, where traveler demand and travel times are highest, are 6:30 a.m. to 8:30 a.m. and 3:30 p.m. to 6:30 p.m., respectively. The evening peak period is longer than the morning peak period in both directions on Santa Fe Drive.

As noted in Section 4.4.6, DRCOG conducted a signal timing project in 2017 to improve signal coordination and travel times along the corridor. The signal timing project extents were Highlands Ranch Parkway to the south and W. Dartmouth Avenue to the north, and therefore differ from the study extents of this project. Post-implementation travel times were collected by DRCOG under standard travel conditions. Summarized in Table 15, the travel time results for the project indicate up to a 26 percent increase in travel time during peak periods when compared to the off-peak travel time.

Table 15. DRCOG Travel Time Run Data, 2016

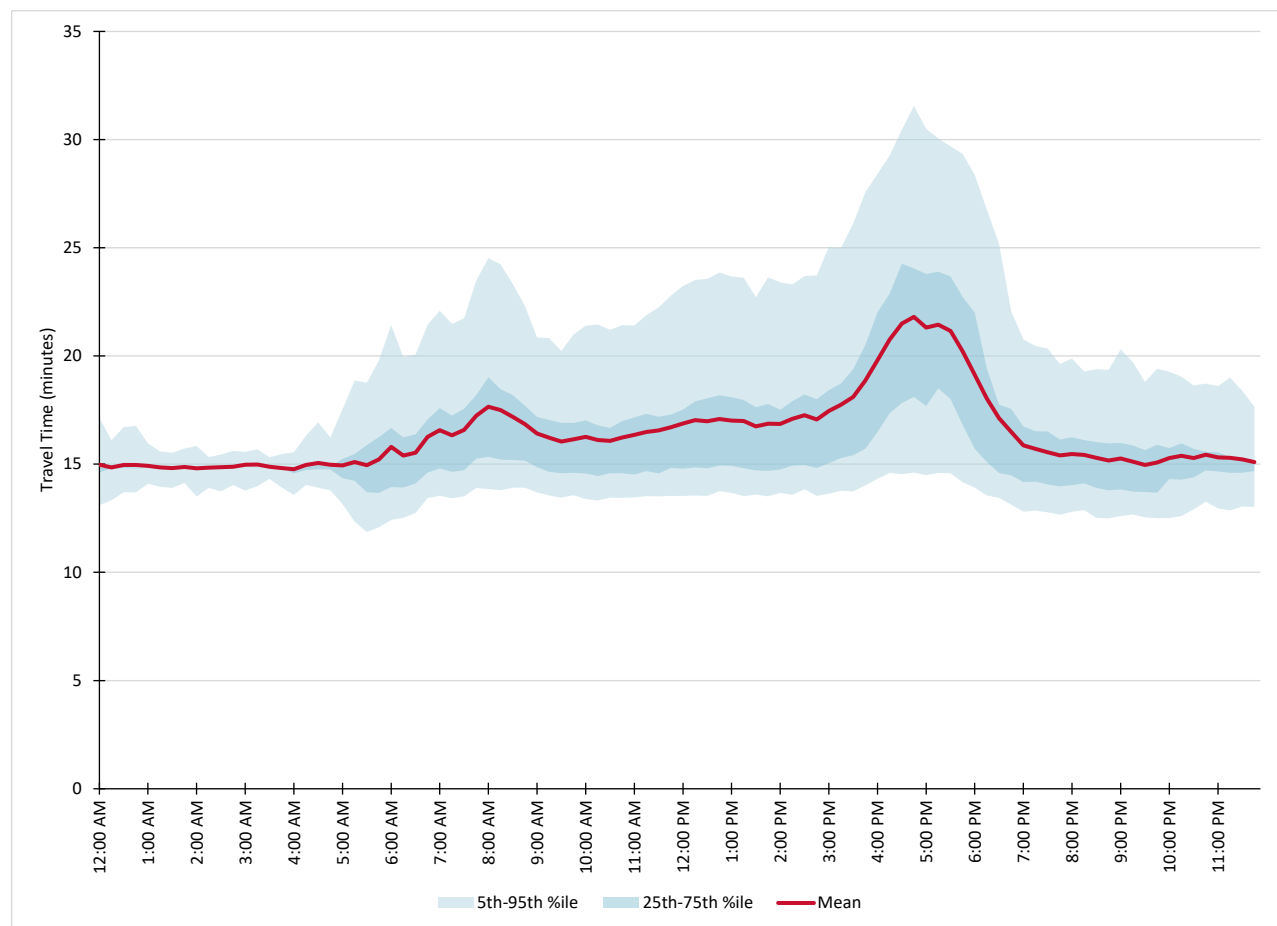
Travel Direction	Off-Peak	Morning Peak		Evening Peak	
	Travel Time (minutes)	Travel Time (minutes)	Change from Off-Peak	Travel Time (minutes)	Change from Off-Peak
Northbound	13:43	17:48	+23%	18:21	+25%
Southbound	12:59	13:40	+5%	17:37	+26%

4.6.1.1 Southbound Travel Time

Southbound corridor traffic experiences a small increase in travel times during the morning peak period, with overall corridor trips taking on average four minutes longer (27 percent) than free-flow travel times. A more significant increase in southbound travel time occurs during the evening peak period, with average travel time between I-25 and C-470 taking seven minutes (47 percent) longer than free-flow travel times.

In addition to variation in travel time by time of day, southbound travel is impacted by reliability. Data for the 5th and 95th percentiles (near-best and near-worst condition) shows that travel times can vary by as much as 10 minutes (± 48 percent) from the average travel time during the evening peak. Figure 45 illustrates the average southbound travel times on Santa Fe Drive between I-25 and C-470, as well as the variability in travel time.

Figure 45. Southbound Santa Fe Drive Travel Time (I-25 to C-470), Weekdays

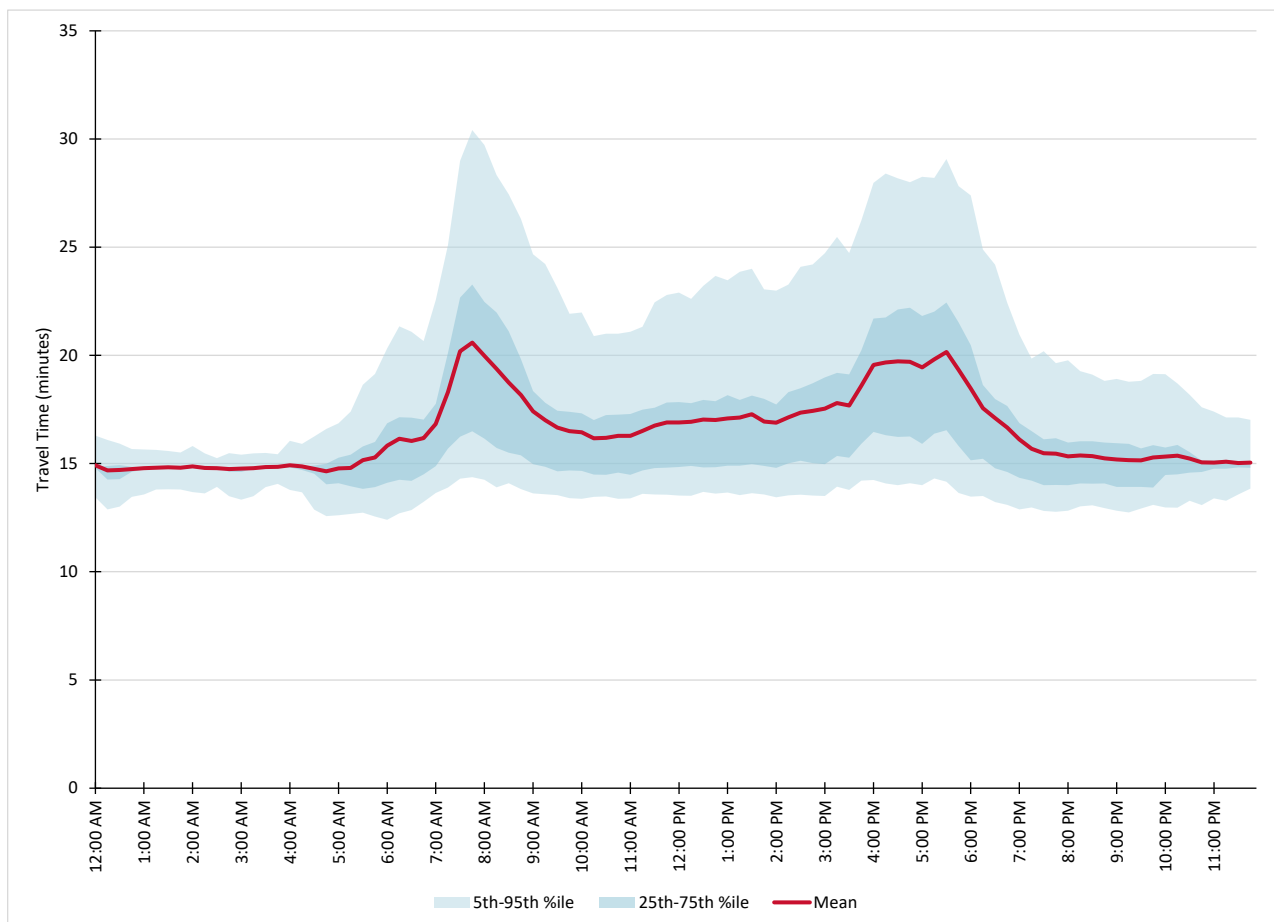


4.6.1.2 Northbound Travel Time

Northbound corridor traffic experiences pronounced increases in travel times during both the morning and evening peak periods, with overall corridor trips taking on average six minutes longer (40 percent) than free-flow travel times during the morning peak and 5 minutes longer (33 percent) during the evening peak.

Northbound travel times are also shown to experience issues with reliability. Data for the 5th and 95th percentiles shows that travel times can vary by as much as 10 minutes (\pm 49 percent) from the average travel time during the evening peak. Figure 46 illustrates the average northbound travel times on Santa Fe Drive between C-470 and I-25, as well as the variability in travel time.

Figure 46. Northbound Santa Fe Drive Travel Time (C-470 to I-25), Weekdays



4.6.1.3 Mineral Avenue Study

The *Santa Fe Drive and Mineral Avenue Intersection Study* (City of Littleton, 2019c) included travel time data collection over multiple days. Travel times indicated that Santa Fe Drive congestion in this area is directional—northbound during the morning peak, and southbound during the evening peak—and highly variable due to daily fluctuations in travel demand and corridor conditions.

Southbound queues during the evening peak on one study day were observed to extend up to two miles, back to W. Church Avenue, and travel times were up to twice that of the morning peak. Although there is a high proportion of turning traffic at the W. Mineral Avenue intersection, the through demand northbound and southbound was determined to exceed approach capacity. The variability on conditions is noticeably more pronounced when observing conditions over shorter corridor segments.

4.6.2 Travel Time Reliability

Unexpected delays can have much greater consequences than everyday congestion, and travelers are less tolerant of such delays. By evaluating the extent of unexpected delays, travel time reliability measures better represent a commuter's experience than average travel time.

A travel time index (TTI) compares peak period travel conditions to free-flow conditions, and represents the average additional travel time during congestion compared to light traffic. A planning time index (PTI) accounts for those days with the highest delay, and represents the total time a traveler should allow to ensure on-time arrival 95 percent of the time. A TTI and PTI close to 1.0 represents high trip reliability, with reliability decreasing as TTI and PTI increase. For example, a TTI of 1.3 indicates a 15-minute free-flow trip results in a 19.5-minute travel time, and a PTI of 1.8 means that for a 15-minute trip in light traffic, total time that should be planned for the trip is 27 minutes..

Weekday TTI and PTI for the Santa Fe Drive corridor indicate congested conditions, illustrated in Figure 47. A TTI of approximately 1.4 is measured for northbound travelers during both peak periods, and southbound travelers during the evening peak. The PTI exceeds 2.0 northbound during the morning peak and southbound during the evening peak, indicating that travelers should budget a total time twice that of a light-traffic trip to experience on-time arrival 95 percent of the time.

Analyzing TTI and PTI by segment, as presented in Figure 48, reveals that Segment 1, north of W. Evans Avenue, and Segment 4, south of W. Bowles Avenue, experience the greatest variability in travel time; trips through the central part of the corridor experience a better level of reliability and shorter peak traffic demand duration. TTI and PTI for Segment 1 and Segment 4 exceed the average corridor travel time indices throughout the day. Segment 1 and Segment 4 include numerous closely spaced uncontrolled accesses and signalized intersections, whereas access management is generally much improved in Segment 2 and Segment 3.

A large number of trips are made over relatively short distances on the corridor, and as such the analysis by segment provides a more typical assessment of the traveler experience. Whereas travel time through the entire length of the corridor is averaged over a mixture of segments with very good and very poor mobility, this focused spatial analysis pinpoints the areas with mobility deficiencies. Travelers on Santa Fe Drive between Littleton and Highlands Ranch regularly experience very poor trip reliability throughout the day and especially during peak periods, as do travelers between Englewood and Denver, in both directions on the Santa Fe Drive corridor.

Figure 47. Santa Fe Drive TTI and PTI (between C-470 and I-25), Weekdays

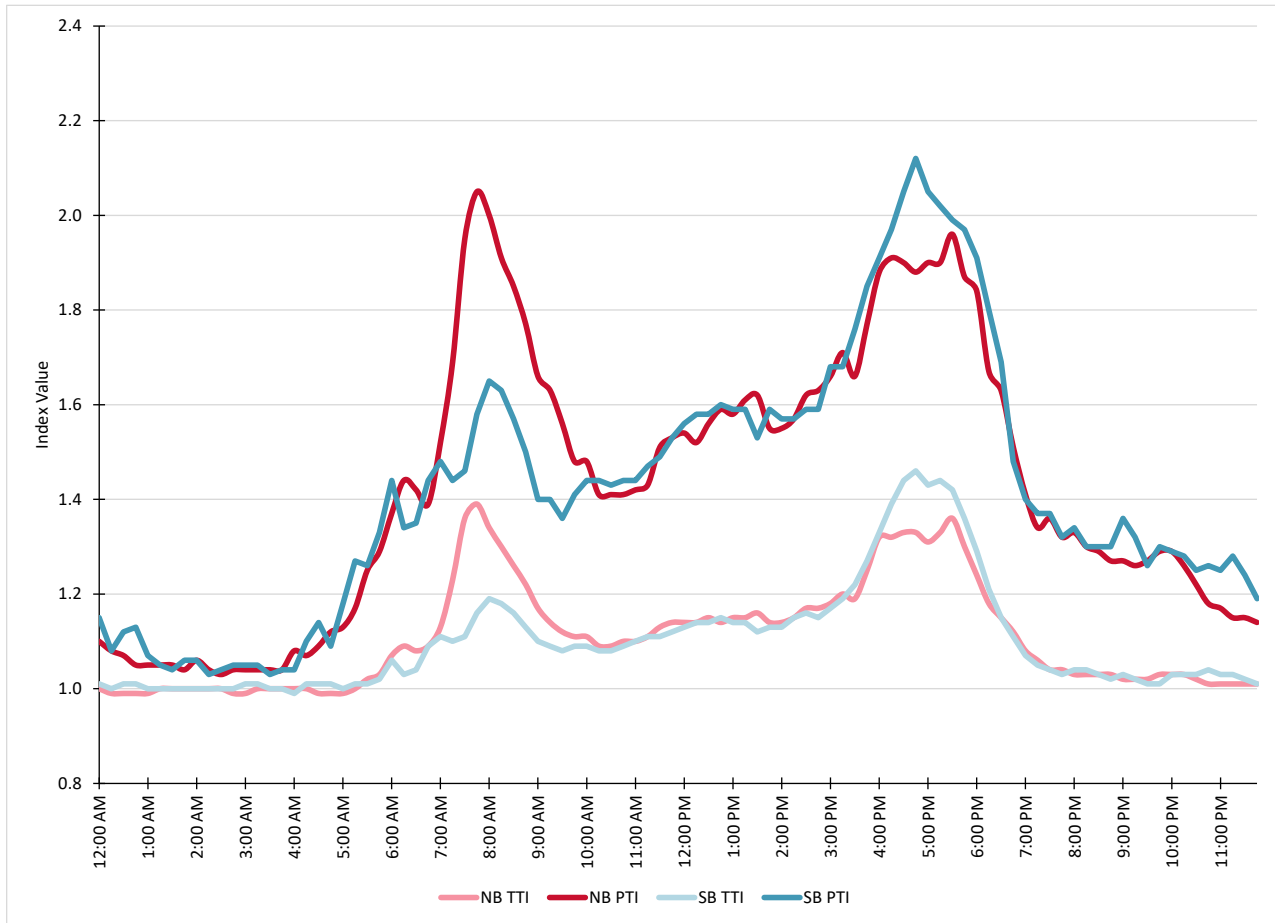
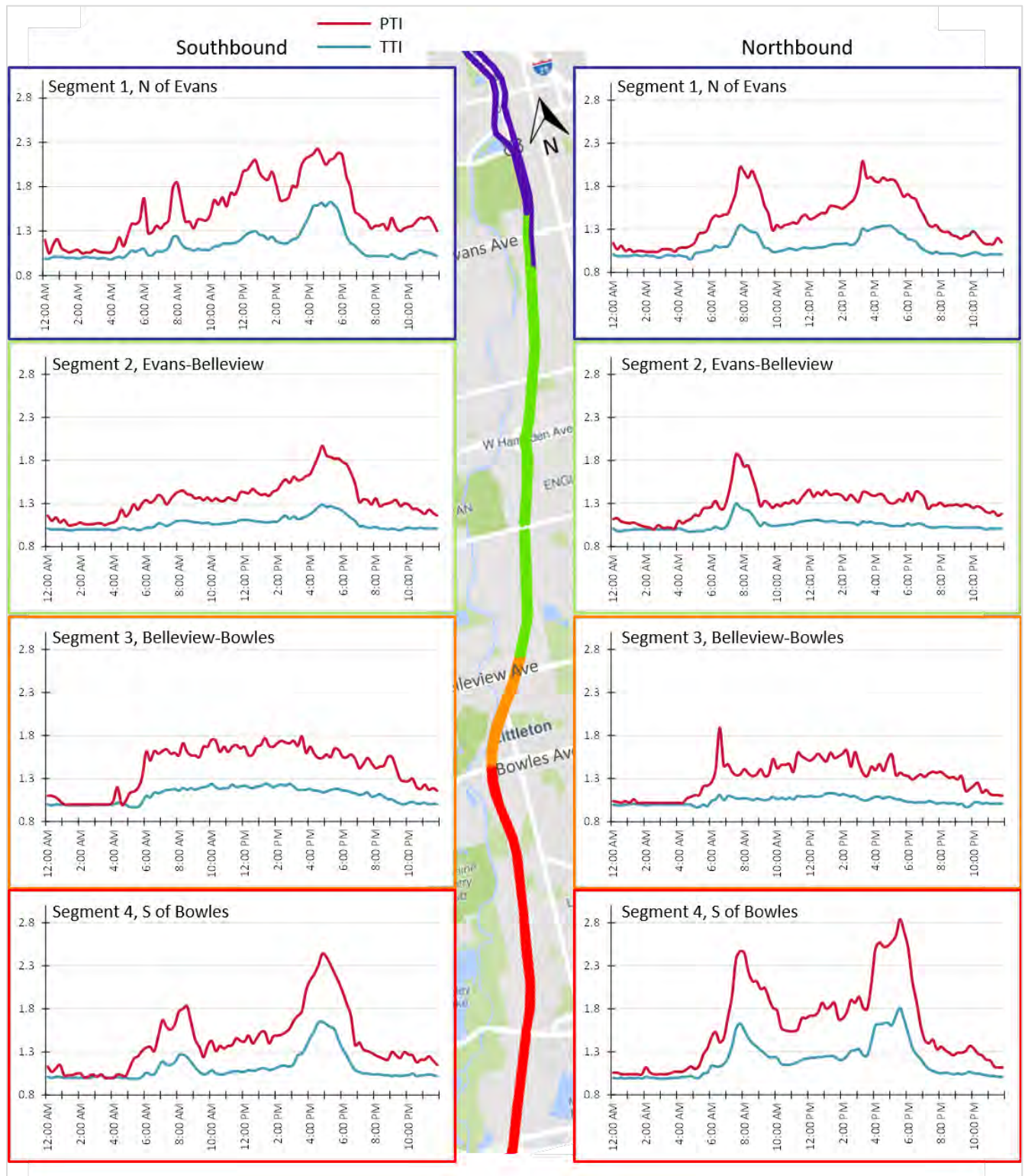


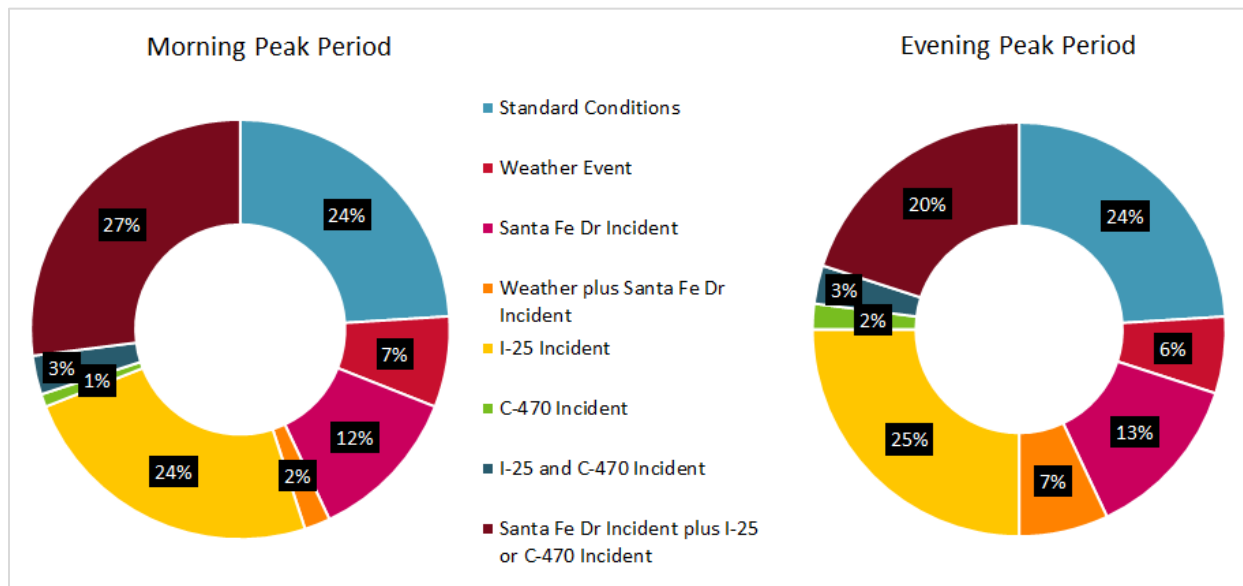
Figure 48. Santa Fe Drive TTI and PTI by Segment, Weekdays



4.6.3 Corridor Condition Variability

Analysis of travel conditions for the four-month sample period of February 2019 through April 2019 reveals that during the AM (6 AM to 10 AM) and PM (3 PM to 7 PM) peak travel periods, for 76 percent of days, the corridor is impacted by either weather events, reduced capacity due to an incident on Santa Fe Drive, or increased demand due to an incident on I-25 or C-470. The frequency of types of corridor condition is illustrated in Figure 49. The corridor is operating under 'standard' non-impacted conditions approximately one in four days, and more often than not these 'standard' days occur on a weekend.

Figure 49. Frequency of Corridor Conditions, Morning and Evening Peak Periods



To observe variability relative to the corridor conditions identified in Figure 49, a variety of traffic and weather data sources were reviewed, and a small pool of representative weekday peak periods identified. This data represents a small snapshot of condition variability. Average southbound peak period travel times are summarized in Figure 50 and average northbound peak period travel times are summarized in Figure 51. 'Non-standard' days are shown to impact travel time, and in some instances the time and duration of the peak period; and consistent with the data shown in Figure 47 and Figure 48, the evening peak shows greater volatility. Weather event days and days with incidents on Santa Fe Drive are shown to be most impactful to travel time reliability, and these conditions occur on approximately one in four days.

Providing pedestrian crossing times at the signalized intersections for the relatively wide roadway also creates additional delay for drivers along Santa Fe Drive when pedestrians utilize the at-grade intersections to cross the corridor. A pedestrian crossing Santa Fe Drive at an intersection as wide as W. Dartmouth Avenue increases the red time for Santa Fe Drive traffic by up to one minute. Pedestrian activations, as well as emergency vehicle preemptions, also take the signal out of coordination for several cycles, impacting traffic flow up and down the corridor.

Figure 50. Southbound Travel Time I-25 to C-470 by Corridor Condition, Morning (left) and Evening Peak

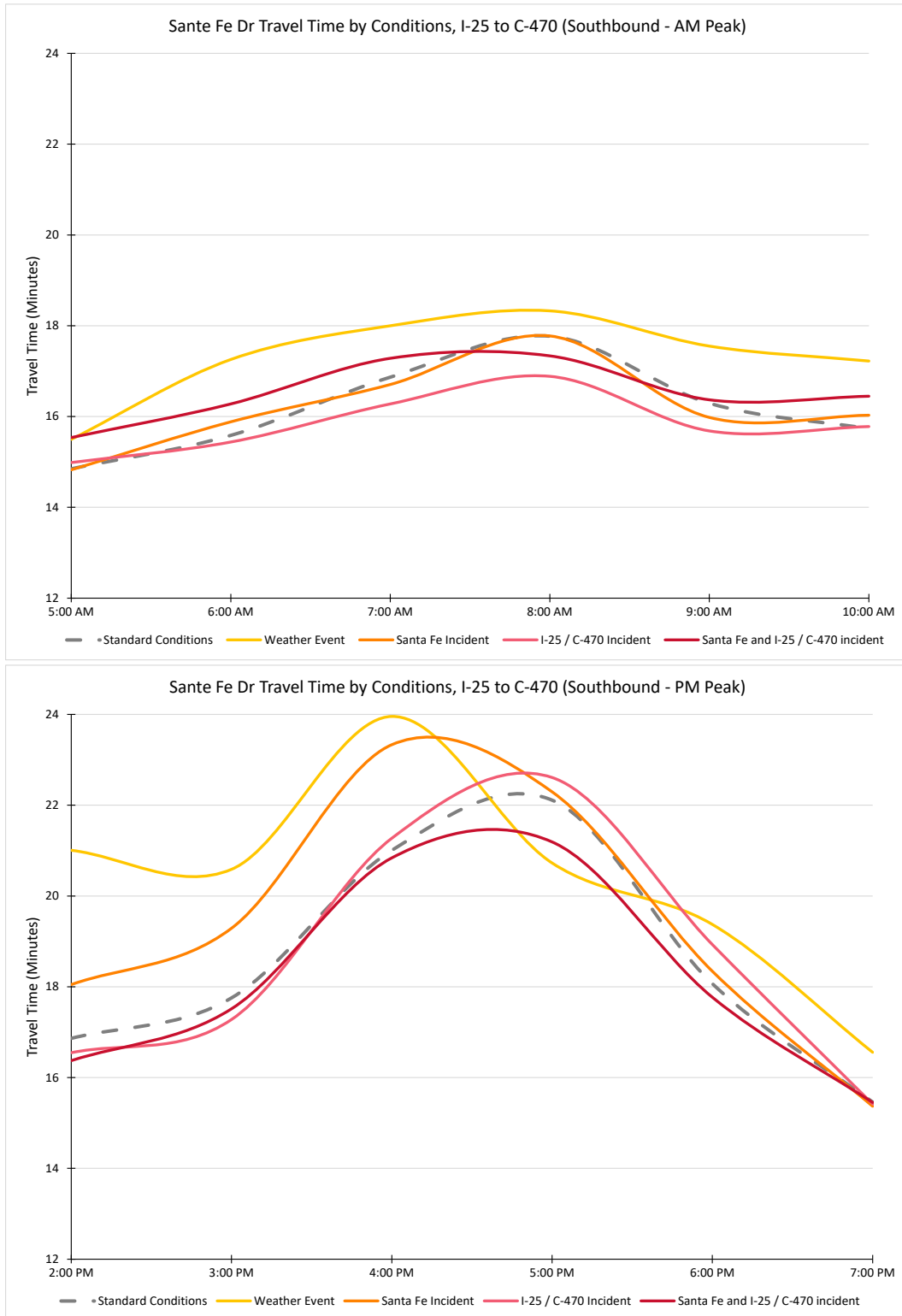
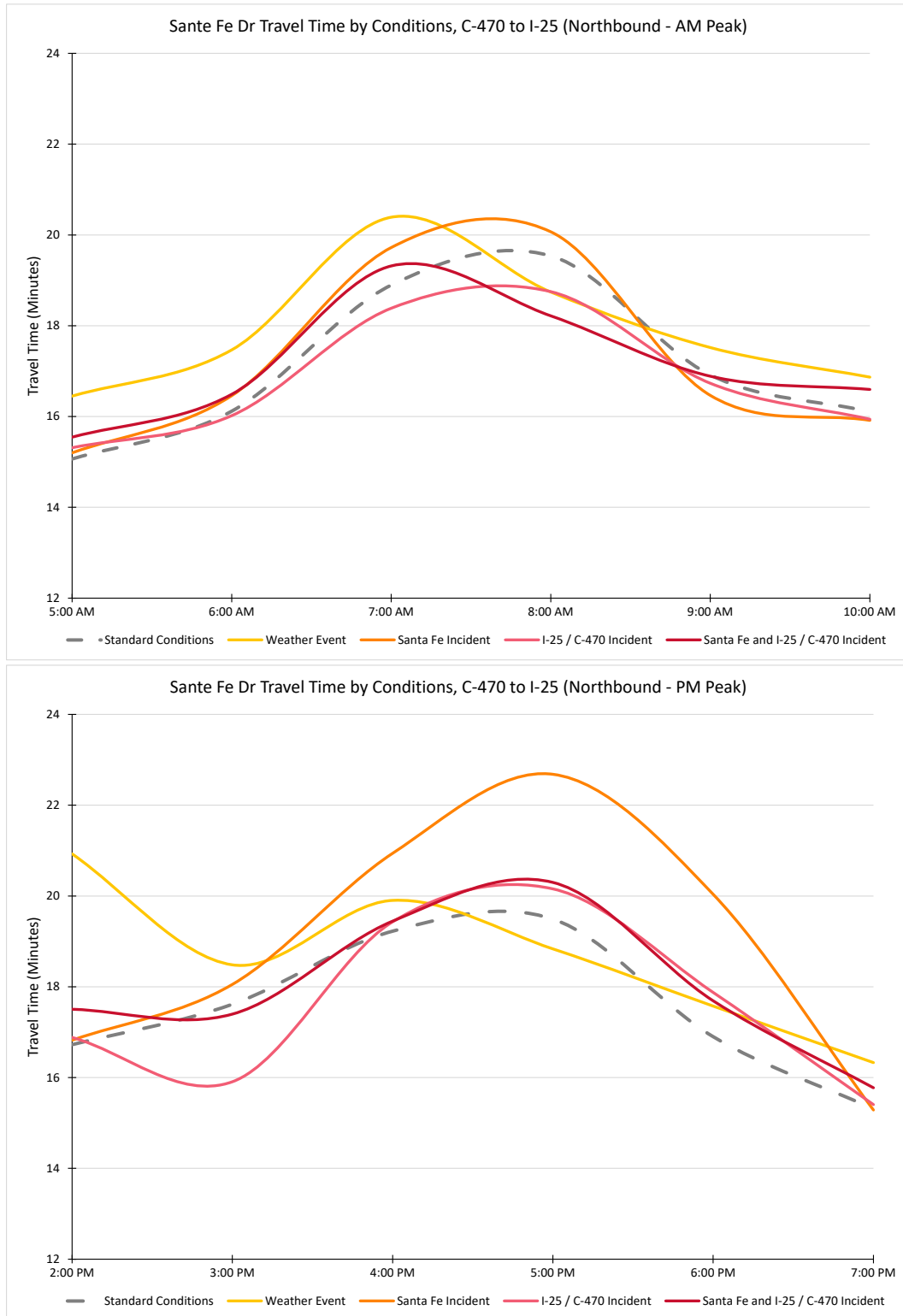


Figure 51. Northbound Travel Time C-470 to I-25 by Corridor Condition, Morning (left) and Evening Peak



4.6.4 Congestion and Bottlenecks

Congestion varies with the prevailing conditions on the corridor. Figure 52 illustrates the weekday congestion along the full corridor extents for a single 'I-25 Incident day' as identified in Figure 49. Peak period heat maps for the same weekday are provided in Figure 53. The figures demonstrate that areas of congestion occur at the locations listed below.

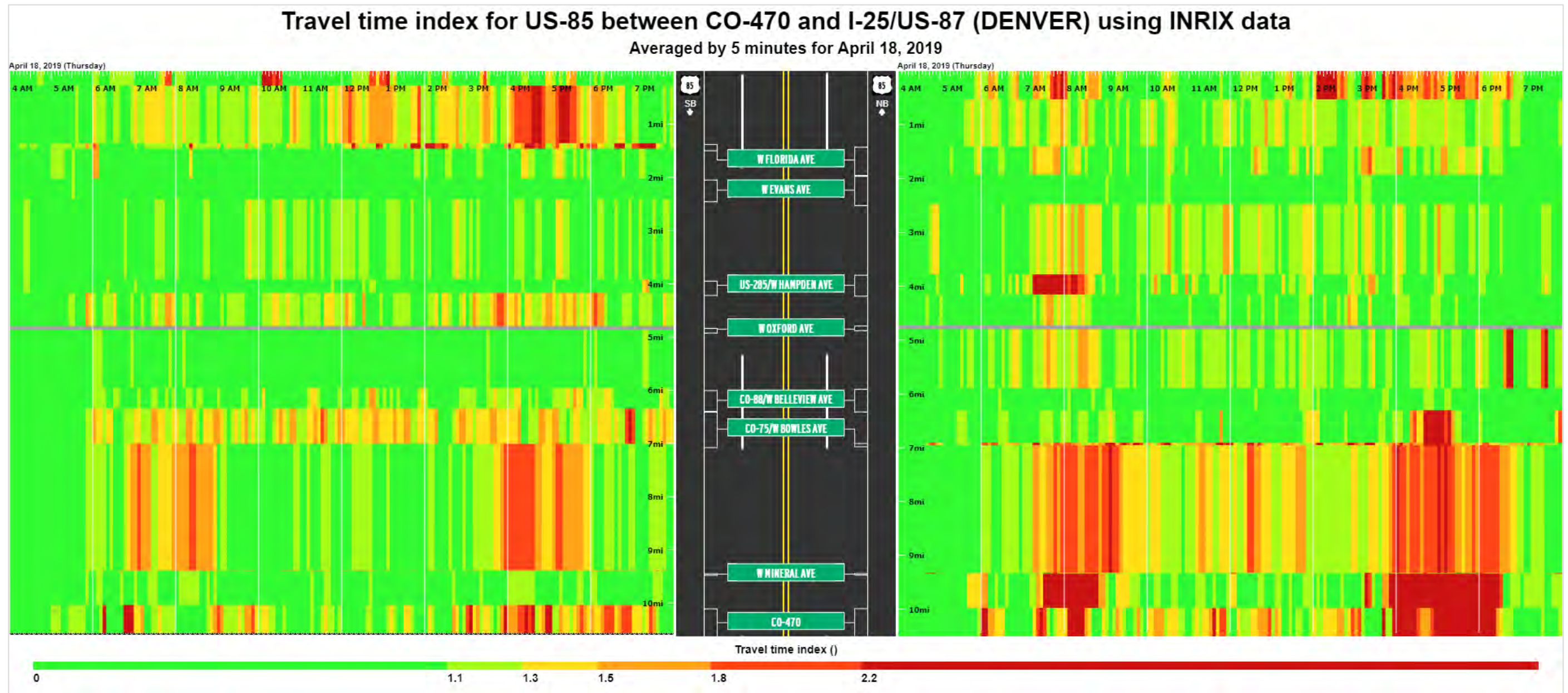
Southbound, to a greater extent during the evening peak

- Between I-25 and W. Mississippi Avenue (W. Mississippi Avenue bottleneck), up to 1.5 miles of congestion to I-25.
- Between W. Dartmouth Avenue and W. Oxford Avenue (W. Oxford Avenue bottleneck), up to one mile of congestion.
- Between W. Bowles Avenue and W. Mineral Avenue (W. Mineral Avenue bottleneck), up to two miles of congestion.
- Approaching the C-470 interchange, up to half a mile of congestion.

Northbound, during both morning and evening peaks

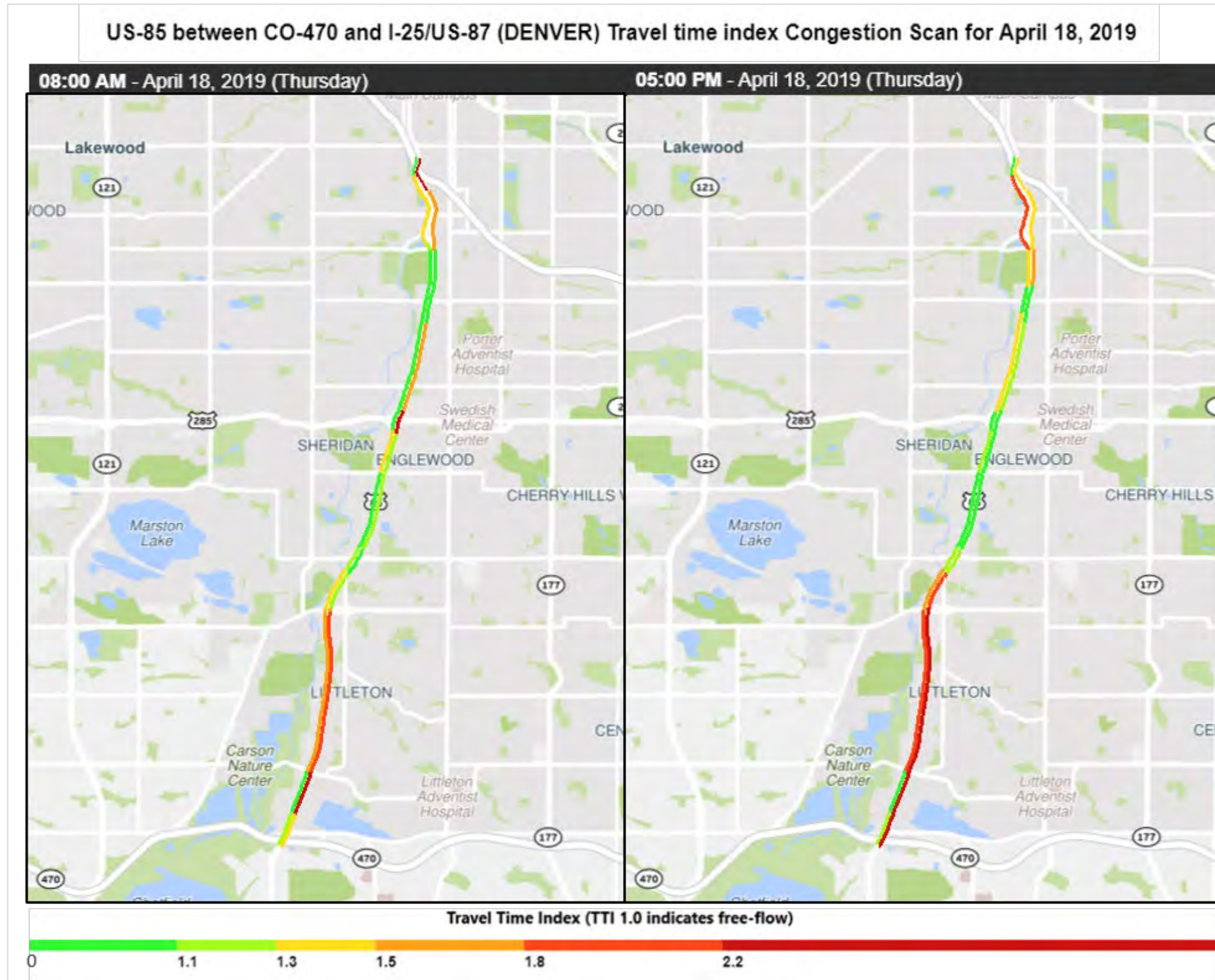
- Between C-470 and W. Bowles Avenue (W. Bowles Avenue bottleneck), up to three miles of congestion.
- Between W. Hampden Avenue and W. Dartmouth Avenue (W. Dartmouth Avenue bottleneck), up to half a mile of congestion.
- Approaching the I-25 interchange (I-25 flyover bottleneck), up to half a mile of congestion.

Figure 52. Santa Fe Drive Congestion Scan, Southbound (left) and Northbound



Source: INRIX.

Figure 53. Santa Fe Drive Congestion Map, Morning (left) and Evening Peak



Source: INRIX

5. Environmental Overview

This chapter includes an overview of the existing social, natural, and built environmental conditions within an established study area. The resources considered generally are consistent with NEPA, its implementing regulations, and Federal Highway Administration (FHWA) and CDOT guidelines.

Existing conditions data for environmental resources was collected within an Environmental Study Area for most resources, defined as a 1,000-foot buffer from the centerline of Santa Fe Drive. For some resources, the area of analysis was adjusted in accordance with resource-specific guidance or professional judgment to cover potential impacts. When the area of analysis differs from the Environmental Study Area, it is defined for those specific resources.

Each resource section includes a brief description of the resource being evaluated, a list of agencies involved in regulation of the resource, a list of laws and regulations pertaining to the resource and relevant studies and plans, a description of data collected and methodology used for the analysis, a summary of the resource's existing conditions based research conducted, and a summary of recommendations for how to use the findings during project planning and NEPA.

At the onset of the *Santa Fe PEL Study (C-470 to I-25)*, CDOT and FHWA agreed that only resources that could potentially have impacts that would influence the development or selection of alternatives during project development would be evaluated.

5.1 Floodplains and Floodways

5.1.1 Brief Description of Resource Studied

The Federal Emergency Management Agency (FEMA) defines a flood as a temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is the policyholder's property) from overflow of inland or tidal waters, unusual and rapid accumulation or runoff of surface waters from any source, or mudflow. The base flood as defined by FEMA is the 100-year flood, or the flood event that has a 1 percent chance of occurring or being exceeded during a given year. Special Flood Hazard Areas (SFHA), Regulatory Floodplains or locally designated floodplains that are not mapped by FEMA are the designated areas that would be subject to inundation during the base flood.

5.1.2 Agencies Involved

- Federal Emergency Management Agency
- Mile High Flood District
- Colorado Department of Transportation
- Colorado Department of Natural Resources, Colorado Water Conservation Board
- Federal Highway Administration

- U.S. Army Corps of Engineers
- Local Floodplain Administrators

5.1.3 Relevant Regulations, Guidance, Studies, and Plans

- Floodplains and floodways are regulated at the federal level by FEMA under the National Flood Insurance Program (NFIP).
- Executive Order 11988 established the NFIP standards to be used in designing highways.
- Floodplains are regulated at the local level by floodplain ordinances of cities and/or counties for both FEMA and non-FEMA floodplains.
- Floodplains are also regulated at the federal level by the USDOT Order DOT 5650.2, which prescribes policies and procedures for ensuring proper consideration to avoid and mitigate adverse floodplain impacts in agency actions, planning programs, and budget requests.
- Colorado Water Conservation Board (CWCB) *Rules and Regulations for Regulatory Floodplains in Colorado* provide uniform standards for regulatory floodplains (or floodplains) in Colorado, to provide standards for activities that may impact regulatory floodplains in Colorado, and to stipulate the process by which floodplains will be designated and approved by the CWCB.

5.1.4 Data Collected/Methodology

The FEMA maintains floodplain data in Flood Insurance Rate Maps (FIRM). The data in this report comes directly from the FIRMs and from the GIS floodplain/floodway data obtained from CDOT and from Flood Hazard Area Delineation studies obtained from the Mile High Flood District and from Flood Hazard Area Delineation studies obtained from Mile High Flood District. The FEMA FIRM panels reviewed include Map Panel Numbers 08005CO432L, 8005C0161K, 08005C0144K, 08005C0433K, 08005C0434K, 08035C0016F, 0800460184H, 0800460192H, 0800460203H, 0800460211H, and 08005C0142K.

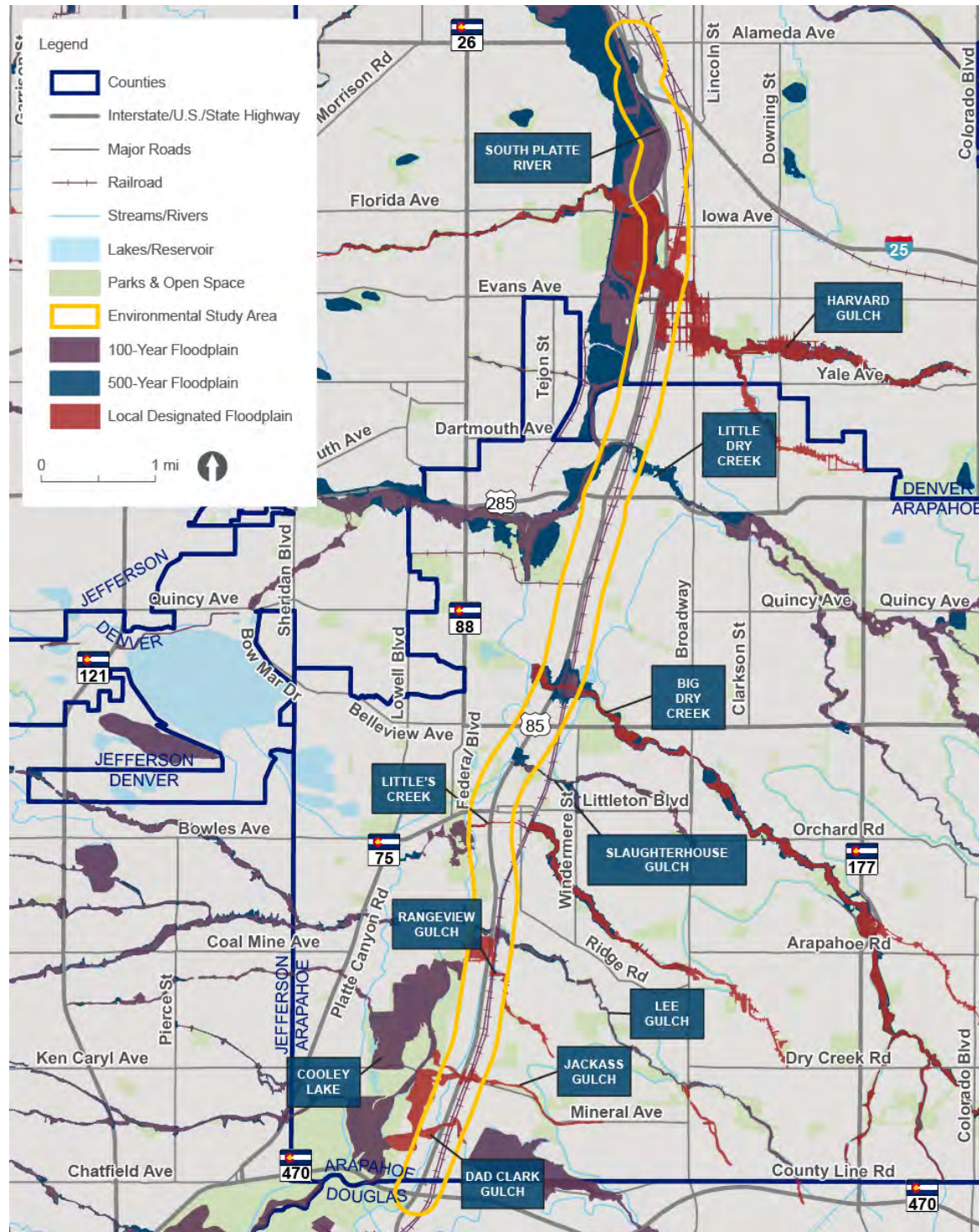
Regulatory floodplain FIRM data was examined for the South Platte River from W. Bayaud Avenue to C-470 along the Santa Fe Drive corridor. The corridor intersects several tributaries with associated floodplains that were also assessed: Harvard Gulch, Little Dry Creek, Big Dry Creek, Slaughterhouse Gulch, Little's Creek, Rangeview Gulch, Jackass Gulch, Dad Clark Gulch, and Lee Gulch.

5.1.5 Findings/Results

Floodplain findings are shown in Figure 54. The South Platte River is the ultimate receiving water for much of the northeast portion of Colorado. The South Platte floodplain is immediately adjacent to Santa Fe Drive for much of the corridor north of W. Florida Avenue. Floodplains from tributaries to the South Platte River also encroach into the Santa Fe Drive right-of-way near W. Evans Avenue (Harvard Gulch), north of W. Belleview Avenue (Big Dry Creek), north of W. Bowles Avenue (Slaughterhouse Gulch), and north of W. Mineral Avenue (Lee Gulch). Between W. Oxford Avenue and Cooley Lake, floodplain delineation data is unavailable, and

additional floodplain delineation efforts would be required to account for the gap in detailed floodplain data in that reach.

Figure 54. Floodplains



5.1.6 Recommendations

Future developments in the corridor should seek to minimize impacts to the floodplain and consider that a Floodplain Development Permit or a Conditional Letter of Map Revision will be required for any work proposed in the floodplain or floodway. This pertains to the South Platte River floodway, as well as the floodways associated with the tributaries along the corridor. Designs should be developed in conjunction with U.S. Army Corps of Engineers (USACE), FEMA, and all other floodplain regulatory authorities. CDOT evaluates potential alternative footprints for transportation projects during NEPA to ensure they do not encroach or alter floodplains and cause future flooding or other adverse impacts. The floodplain evaluation should be completed during development of conceptual design.

5.2 Wetlands and Other Waters of the United States

5.2.1 Brief Description of Resource Studied

Wetlands and other waters of the U.S. (WOUS) resources are wetlands or jurisdictional waters. These resources are required to be evaluated for federally funded projects or when resources are located along a highway right-of-way. Wetlands and other WOUS can include rivers, ponds, lakes, and wetlands.

5.2.2 Agencies Involved

- U.S. Environmental Protection Agency
- Federal Highway Administration
- U.S. Army Corps of Engineers
- Colorado Department of Transportation
- Colorado Parks and Wildlife
- State Historic Preservation Officer
- U.S. Fish and Wildlife Service

5.2.3 Relevant Regulations, Guidance, Studies, and Plans

- Section 404 of the Clean Water Act (CWA), 1972: The CWA provides the regulatory framework when dredging or filling activities occur in a WOUS. The CWA requires coordination with USACE; resource agencies, such as the U.S. Fish and Wildlife Service (USFWS); and the State Historic Preservation Officer (SHPO), when impacts occur to wetlands.
- Executive Order 11990 Protection of Wetlands, 1977: Occurs when federal funding is used or where resources are located within highway right-of-way. This Executive Order requires federal agencies to compensate for impacts to all wetlands regardless of their jurisdictional status.
- CDOT Wetland Guidance: A Wetland Finding needs to be completed if permanent impacts to wetlands and other WOUS exceed 500 square feet or a combination of permanent and temporary impacts exceed 1,000 square feet. Additionally, a Functional Assessment of

Colorado Wetlands (FACWet) analysis is required for CDOT/FHWA projects and FHWA-funded projects if the impact to wetland habitat is 0.10 acre or greater (CDOT, 2020d). CDOT's wetlands program requires one-to-one replacement of both jurisdictional and non-jurisdictional wetlands impacted by projects.

- *Guidelines for Senate Bill 40 Wildlife Certification* (CPW, 2018) describes Senate Bill 40 Wildlife Certification (33-5-101-107, CRS 1973 as amended) (SB 40) and requires that any agency of the State obtain certification from the Colorado Parks and Wildlife (CPW) when an agency plans construction in a stream or its banks or tributaries. Recommended projects that could impact an SB 40 Jurisdictional stream may require SB 40 certification, which would include mitigation measures designed to improve fish and wildlife habitat.
- The *I-25 Central PEL Study Report* (CDOT, 2020a) describes the South Platte River and adjacent wetlands as regulated and jurisdictional WOUS. Impacts to WOUS should be identified early in the scoping process because of the USACE permitting process timeframe.
- The *Planning and Environmental Linkages (PEL) Report for the Douglas County US 85 Corridor Improvements Study* (CDOT, 2016b) identifies wetlands and other WOUS within the Environmental Study Area, potential mitigation measures and analyses for anticipated impacts.
- Through a preliminary desktop assessment, the *Englewood Forward Light Rail Corridor Next Steps Study* (City of Englewood, 2015a) identified potential wetlands and other WOUS associated with the South Platte River, Little Dry Creek, Big Dry Creek, and the City Ditch. For any future projects, the study recommends a formal wetland delineation to verify these findings.

5.2.4 Data Collected/Methodology

In the arid west, vegetation patterns, topography, and drainage patterns are good indicators of the potential occurrences of wetlands and other WOUS. For this high level review of wetlands and other WOUS in the Environmental Study Area, the following data sources were reviewed for information and potential or known wetlands in the project vicinity:

- Aerial Imagery—Recent and historic imagery from 1993 through 2018.
- Topographic map—United States Geological Survey.
- National Wetlands Inventory data (USFWS, 2020a).
- General ecological description of the project area (USDA, 2006).

5.2.5 Findings/Results

The Environmental Study Area contains several riverine, open waters, and wetlands. These are described in Table 16 and shown in Figure 55, Figure 56, and Figure 57, along with their jurisdictional status. Of the features listed, the South Platte River, Lee Gulch, and Big Dry Creek have the most intact vegetation and largest wetland and riparian communities adjacent to Santa Fe Drive. The wetlands and other Waters of the U.S described below are based on desktop

analysis and additional jurisdictional and non-jurisdictional wetlands and other Waters of the U.S may be present within the Environmental Study Area.

Table 16. Wetlands and other Waters of the U.S.

Water Feature	Feature/Habitat Types	Jurisdictional
Denver (Figure 55)		
<ul style="list-style-type: none"> ▪ South Platte River ▪ Unnamed streams and ponds 	Streams, riverine and emergent wetlands, riparian areas, and ponds	Yes
Englewood, Sheridan, and Littleton—North of W. Bowles Avenue (Figure 56)		
<ul style="list-style-type: none"> ▪ South Platte River ▪ Little Dry Creek ▪ Slaughterhouse Ditch ▪ City Ditch ▪ Big Dry Creek ▪ Unnamed streams and ponds 	Streams, riverine, emergent, and forested/shrub wetlands, riparian areas, and ponds	Yes
Littleton—South of W. Bowles Avenue (Figure 57)		
<ul style="list-style-type: none"> ▪ Little's Creek ▪ City Ditch ▪ Lee Gulch ▪ Unnamed streams and ponds 	Streams, riverine, emergent, and forested/shrub wetlands, riparian areas, and ponds	Yes

Source: USFWS, 2020a.

Figure 55. Wetlands and other Waters of the U.S. (1 of 3)

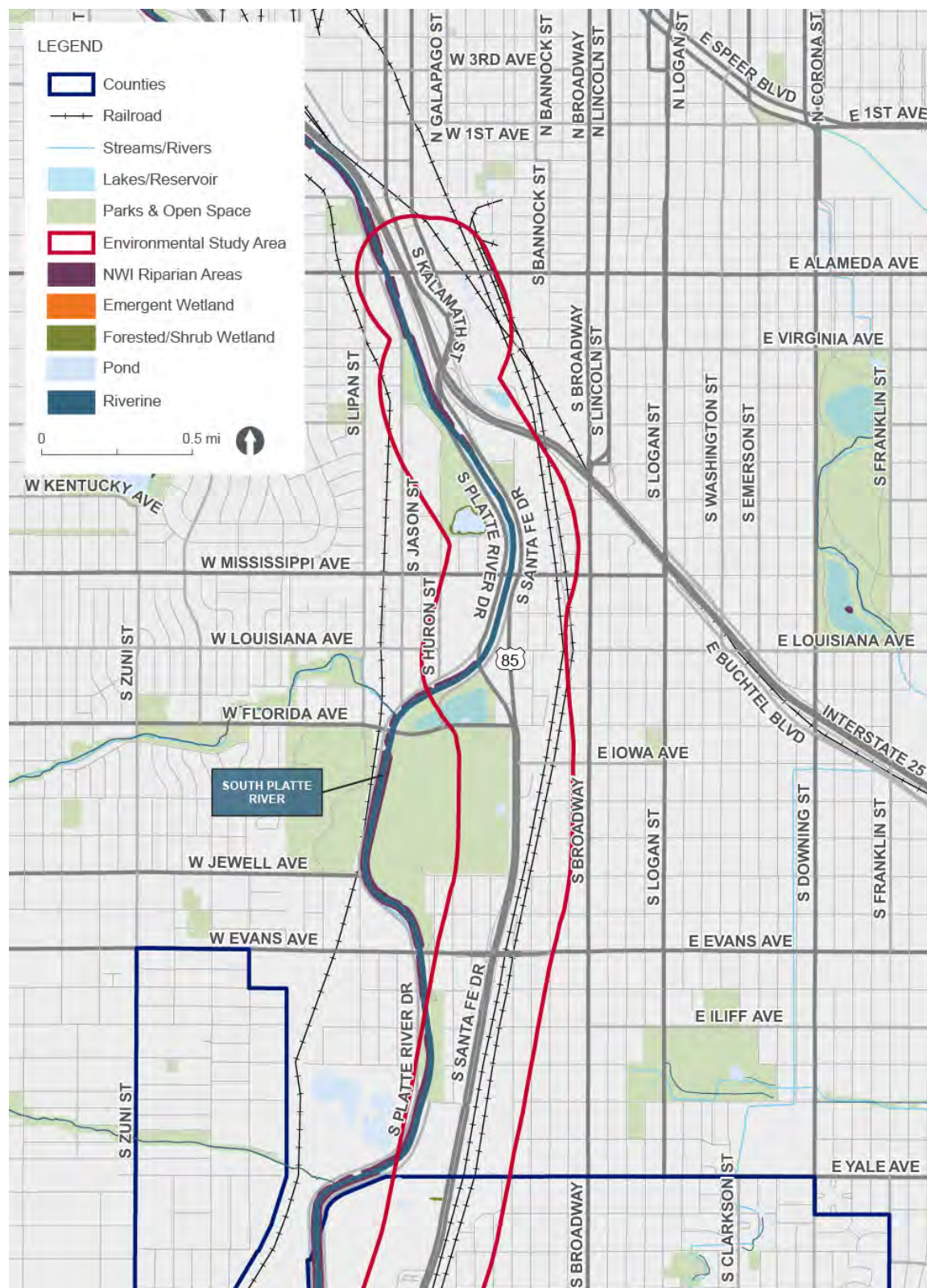


Figure 56. Wetlands and other Waters of the U.S. (2 of 3)

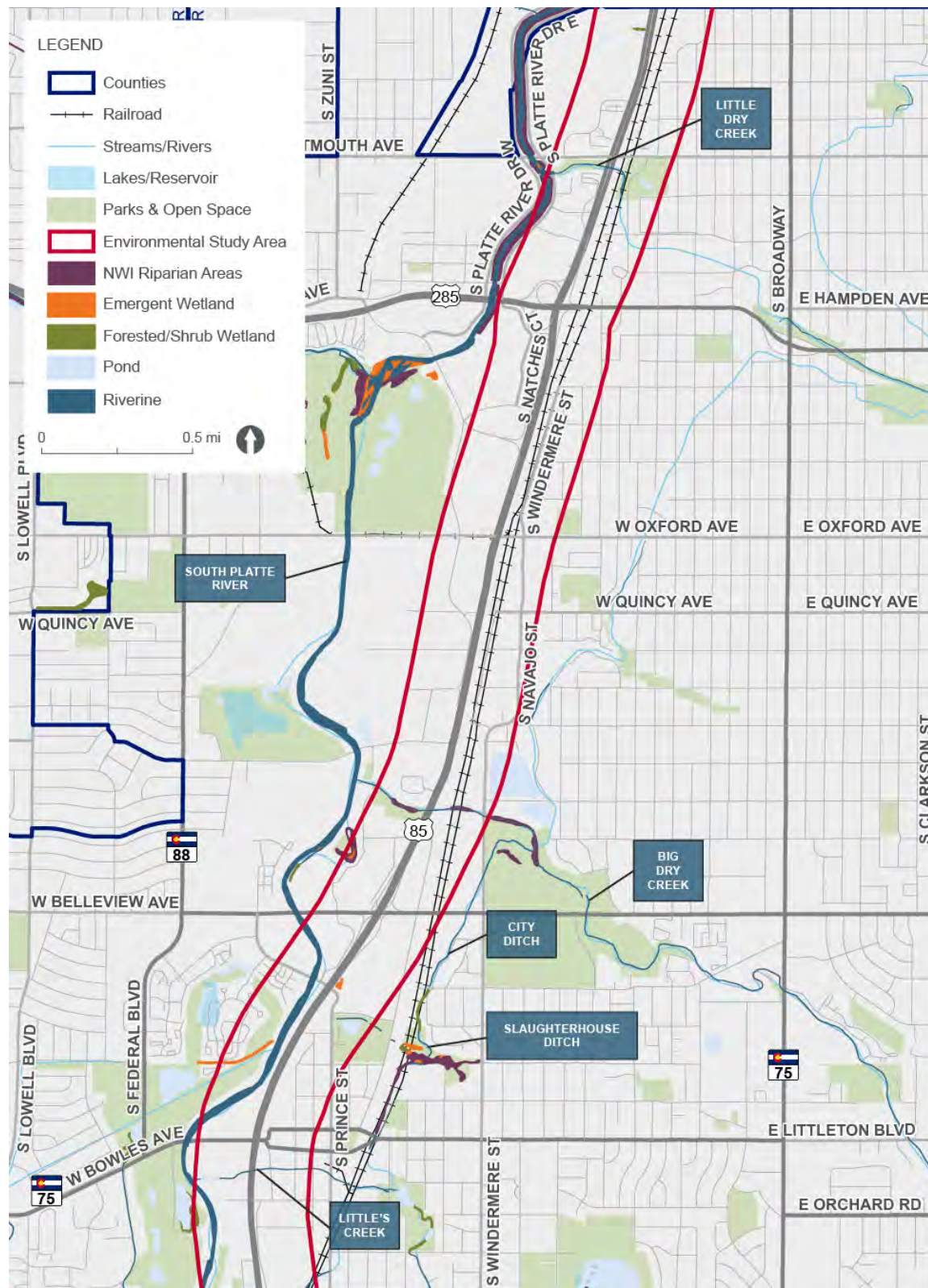
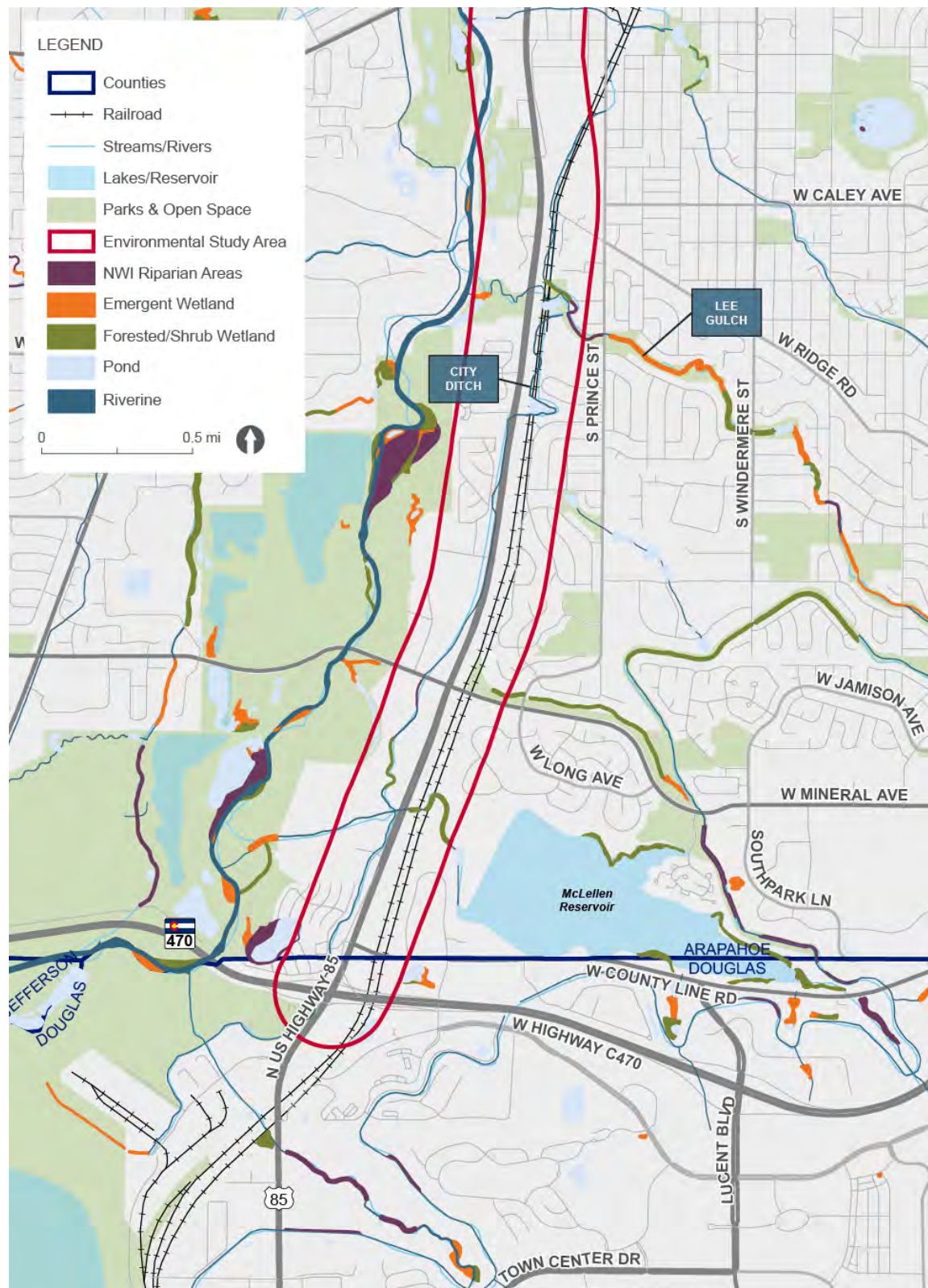


Figure 57. Wetlands and other Waters of the U.S. (3 of 3)



5.2.6 Recommendations

During NEPA, if proposed project improvements impact an area that may contain wetlands or other WOUS, an aquatic resources delineation of the corridor would be required that would define the quantity of wetlands and other WOUS within the corridor. Additional permits and documentation are required under Section 404 of the Clean Water Act and CDOT policy if wetlands or other WOUS are impacted. CDOT would require a FACWet analysis and a Wetland Finding Report if applicable wetland impact thresholds are exceeded. These requirements can add time and cost to project development and construction activities, and long lead times are required for project implementation.

A concerted effort should be made to avoid wetlands and WOUS during conceptual design, and NEPA and any subsequent design refinements. Where avoidance is not possible, impacts to wetlands and other WOUS should be quantified. A Section 404 permit can take between 45 days (Nationwide Permit) and up to a year (Individual Permit) to process, depending on the permit type. Wetland impacts can be compensated by purchasing wetland credits or creating a wetland within the project study area or nearby, depending on agreements made with the USACE.

Additionally, during NEPA, if proposed project improvements impact an area that may contain an SB 40 Jurisdictional stream or its banks or tributaries, the project would be required to document SB 40 certification with CPW, which would include mitigation measures designed to improve fish and wildlife habitat.

5.3 Water Quality

5.3.1 Brief Description of Resource Studied

Water quality resources include surface water, groundwater, climate, topography, geology, and land use. Transportation projects can impact drainage and water quality resources during construction and maintenance/operation phases.

5.3.2 Agencies Involved

- Federal Highway Administration
- Colorado Department of Public Health and Environment
- Colorado Department of Transportation
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- Local agencies

5.3.3 Relevant Regulations, Guidance, Studies, and Plans

- CDOT Permanent Water Quality Program: This program contains the guidance and policies regarding stormwater runoff and permanent water quality needs, and includes the CDOT Municipal Separate Storm Sewer System (MS4) program.

- CDOT Water Quality Construction Site Program: This program provides guidance on temporary erosion and sediment control management for construction activities.
- Local Agency Guidance: Each local agency has their drainage design criteria and MS4 program documents.
- Section 303(d) of the CWA (EPA, 2020a and 33 United States code [U.S.C.] 1972) requires states to maintain a list of waters that are considered impaired for certain pollutants. CDOT's MS4 Permit includes roadway construction pollutants of concern, which are the following, total suspended solids, arsenic, cadmium, chromium, copper, magnesium, manganese, zinc, ammonia nitrogen, total phosphorus, chloride, sodium, oil, and grease. These require treatment prior to discharge if certain conditions are met (33 U.S.C. § 1251-1388 1972 and CDOT, 2020e).

5.3.4 Data Collected/Methodology

Water resources were assessed within the Environmental Study Area. The following resources were reviewed:

- CDOT Online Transportation Information System (CDOT, 2020e)
- United States Geological Survey (USGS) National Hydrographic Dataset (USGS, 2020)
- Colorado Department of Public Health and Environment (CDPHE) Clean Water GIS Maps (CDPHE, 2020a)

5.3.5 Findings/Results

Streams in the Environmental Study Area, with an indication of whether they are included in the 303(d) list, and if they contain a roadway pollutant of concern, are included in Table 17 and shown in Figure 58, Figure 59, and Figure 60.

Table 17. Streams in the Environmental Study Area

Location/Name	303(d) Listed (Y/N)	Roadway Pollutants of Concern
Denver (Figure 58)		
South Platte River	Yes	Arsenic
Sanderson Gulch	Yes	n/a
Harvard Gulch	Yes	n/a
West Harvard Gulch	Yes	n/a
Englewood, Sheridan, and Littleton—North of W. Bowles Avenue (Figure 59)		
South Platte River	Yes	Arsenic
Little Dry Creek	No	n/a
Bear Creek	Yes	n/a
Big Dry Creek	Yes	n/a
City Ditch	No	n/a
Slaughterhouse Ditch	No	n/a
Little's Creek	No	n/a
Littleton—South of W. Bowles Avenue (Figure 60)		
South Platte River	Yes	Arsenic
Dutch Creek	Yes	n/a
Lee Gulch	No	n/a
City Ditch	No	n/a

Figure 58. Surface Waters (1 of 3)

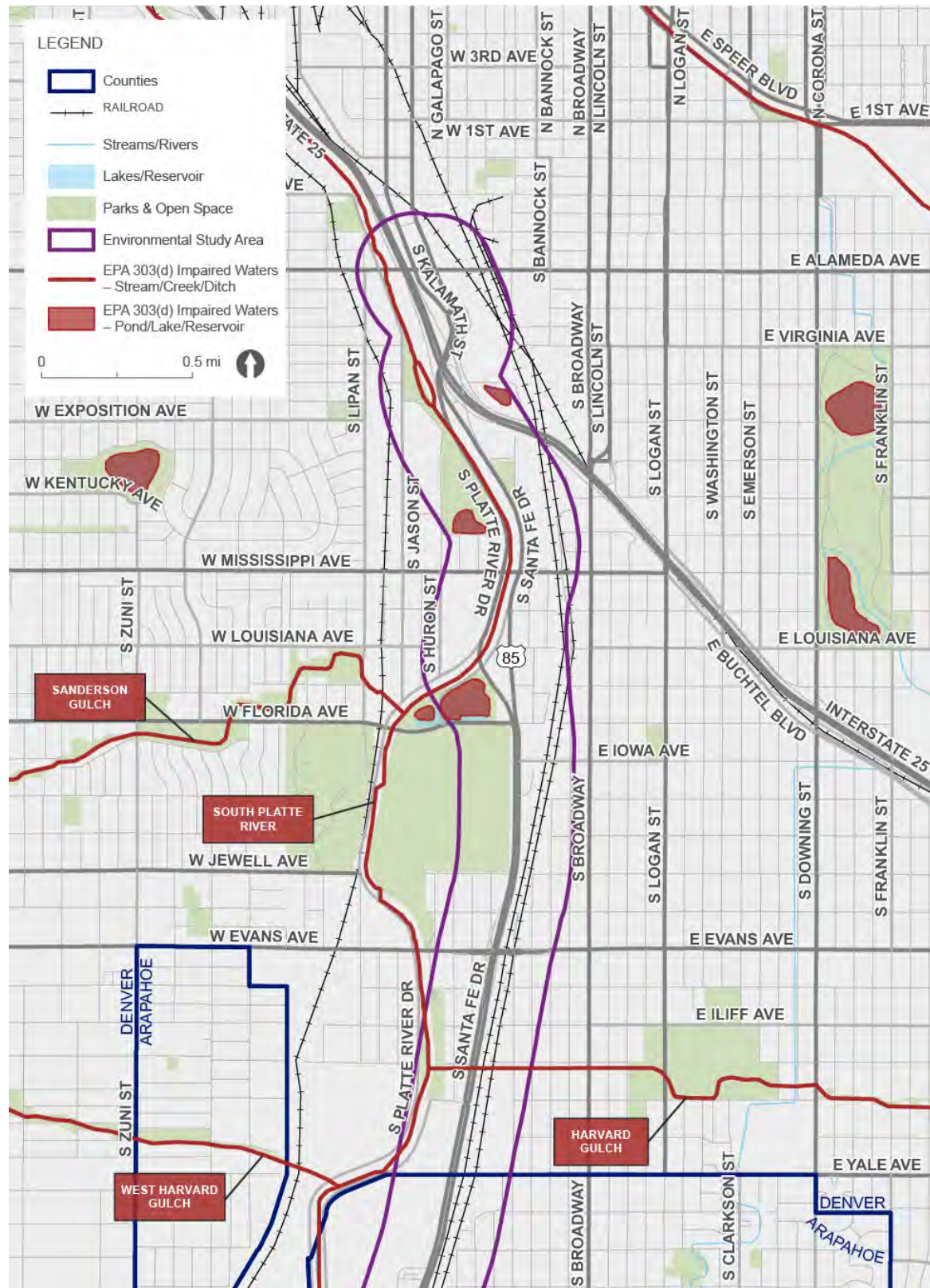


Figure 59. Surface Waters (2 of 3)

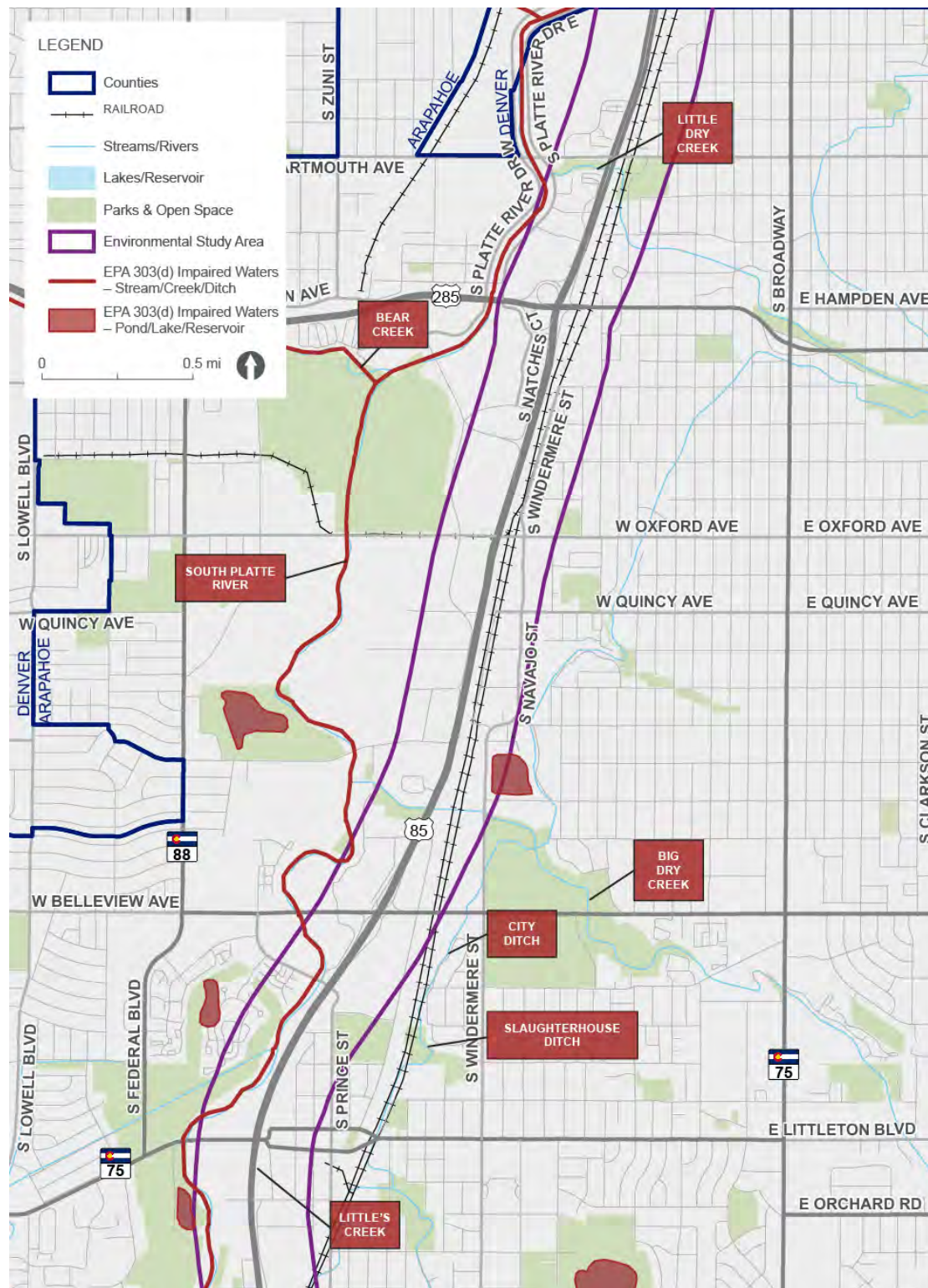
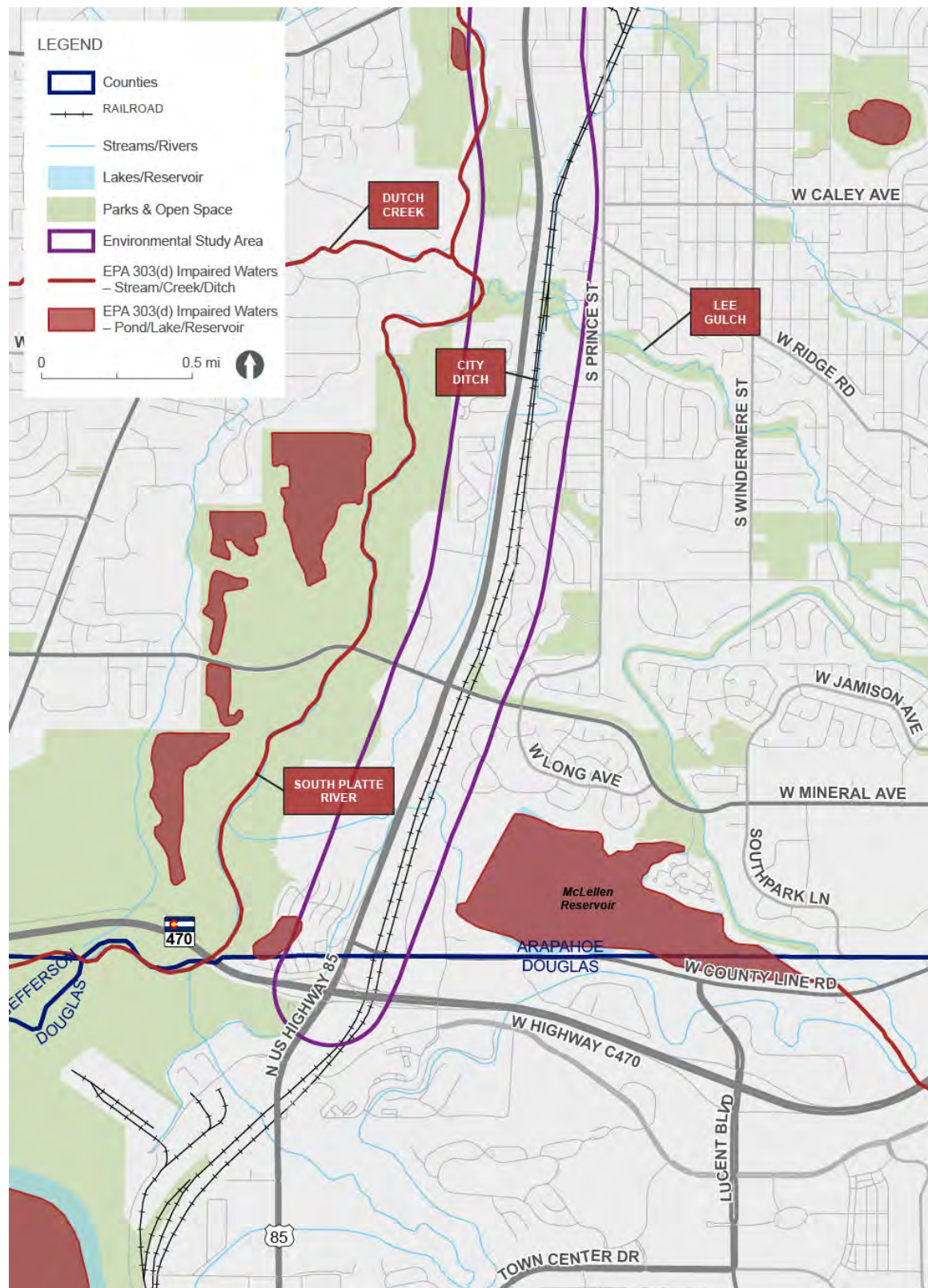


Figure 60. Surface Waters (3 of 3)



In addition to named surface waters, there are multiple unnamed ditches, canals, stormwater sewer systems, and open water features, such as ponds, lakes, and reservoirs. These open waters, some of which are on the 303(d) list, are shown in shown in Figure 58, Figure 59, and Figure 60.

The entire Environmental Study Area falls under Municipal Separate Storm Sewer System (MS4) permit coverage, with each municipality holding its own permit. In addition, the CDOT MS4 Permit is applicable, within CDOT right-of-way, throughout the entire corridor.

Roadside drainage within the Environmental Study Area flows to curbs and gutters into roadside ditches and stormwater drainage systems. Stormwater eventually drains to the receiving water South Platte River.

5.3.6 Recommendations

For future projects, during NEPA, MS4 boundaries and 303(d) listings should be confirmed. The need for permanent water quality should be considered based on conceptual designs, and in coordination with CDOT and municipalities. Long-term maintenance of permanent water quality control measures will need to be determined during NEPA, before final design is completed. Permanent water quality control measures can result in increased right-of-way impacts, affecting cost and schedule.

CDOT's Mitigation Pool was set up to provide funding for permanent water quality design and construction and to fund stand-alone water quality treatment projects where CDOT is a partner. This is a possible funding mechanism for permanent water quality control measures.

The following permits, and their respective terms and conditions, may apply to future projects:

- MS4 Permit: Governs stormwater discharges from CDOT facilities and discharges in municipalities and county urbanized areas with a population of at least 50,000 (CDOT, 2020d). If certain thresholds are exceeded, the terms and conditions of MS4 permits must be met (CDOT, 2015a). MS4 coverage is present throughout the corridor.
- CDPHE Stormwater Discharges Associated with Construction Activity Permit: All construction activities that disturb at least one acre of ground or are part of a larger common plan of development are required to seek coverage under the stormwater construction permit (CDPHE, 2020b and CDOT, 2020e).
- CDPHE Dewatering Discharge Permit: There are two CPDHE dewatering permits that apply to construction activities. Either may be applicable if a future project requires dewatering (CDPHE, 2020c).
- Local Agency Permits: City and County of Denver Construction Activities Stormwater Discharge Permit, City of Sheridan Stormwater Quality Permit, City of Littleton Grading Permit, Douglas County Drainage and Erosion Control Permit, and the Arapahoe County Grading, Erosion, and Sediment Control Permit.

5.4 Threatened & Endangered Species, Species of Special Concern, Migratory Birds and Eagles

5.4.1 Brief Description of Resource Studied

Threatened and endangered species, species of special concern, migratory birds, and eagles are specific wildlife resources that exist or have the potential to exist within the Environmental Study Area. These resources must be evaluated when using federally funded projects or when resources are located along a highway right-of-way. Wildlife or wildlife habitat can include wetlands, riparian areas, native shortgrass prairie, prairie dog colonies, or other areas that host species of avian, terrestrial, or aquatic species of interest.

5.4.2 Agencies Involved

- Federal Highway Administration
- U.S. Fish and Wildlife Service
- Colorado Department of Agriculture
- Colorado Department of Transportation
- Colorado Parks and Wildlife

5.4.3 Relevant Regulations, Guidance, Studies, and Plans

CDOT prepared a Biological Resources Report and Biological Assessment summarizing wildlife and threatened and endangered species resources for the US 85 Corridor Improvements Highlands Ranch Parkway to C-470 project (CDOT, 2016c; CDOT, 2016d). The US 85 Corridor Improvements Highlands Ranch Parkway to C-470 project begins at the southern terminus of the *Santa Fe PEL Study (C-470 to I-25)* study area at C-470 and ends at Highlands Ranch Parkway. The Biological Assessment included a determination of *may affect not likely to adversely affect* the Preble's meadow jumping mouse.

The *I-25 Central PEL Study Report* (CDOT, 2020a) describes habitat in the northern portion of the project area as "lacking." As a result, threatened, endangered, and species of concern are not expected to be present in the northern portion of the Environmental Study Area due to the lack of suitable habitat and development in the area.

Relevant regulations include the following:

- Section 7 of the Endangered Species Act, 1973: Provides regulatory oversight when impacts may occur to species listed under the Act, and requires coordination with the USFWS and resource agencies, such as CPW, when impacts occur to wildlife species.
- Migratory Bird Treaty Act, 1918: Provides regulatory protection of native migratory birds, eggs, and young and requires coordination with the USFWS and CPW.

- Bald and Golden Eagle Protection Act, 1940: Provides regulatory protection of bald and golden eagles, their nests, eggs, and young and requires coordination with USFWS and CPW.
- Colorado's Nongame, Endangered, or Threatened Species Conservation Act, 2016: Lists state specific species that CPW has a priority to manage and includes state threatened, state endangered, species of special concern, and species listed on Programmatic Biological Opinions.
- CDOT Impacted Black-Tailed Prairie Dog Policy (CDOT, 2009).
- Colorado Department of Agriculture (CDA) Noxious Weed Act, 2017: Provides the management objectives for state-designated noxious weeds.

5.4.4 Data Collected/Methodology

Wildlife resources and habitat information were reviewed within the Environmental Study Area, which is defined as an approximate 1,000-foot buffer from the Santa Fe Drive centerline within the project limits. A 0.50-mile buffer was used for federally listed species and raptors. The 0.50-mile radius from the proposed centerline of the roadway encompasses the potential for noise impacts and visual disturbance from construction activities and ensures compliance with the CPW raptor buffers for Bald Eagles.

The following information sources were reviewed:

- Federal candidate, threatened, and endangered species, as identified by the U.S. Fish and Wildlife Service (USFWS) online Information, Planning and Conservation (IPaC) System (USFWS, 2020b).
- Colorado sensitive, threatened, and endangered species (CPW, 2020a).
- CPW Google Earth Species Maps (CPW, 2020b).
- Colorado Natural Heritage Program (CNHP) species distribution maps and Geographic Information System (GIS) map layers (CNHP, 2020).
- eBird for recent sightings of federal or state listed birds in the project area (Sullivan et al. 2009)

5.4.5 Findings/Results

Table 18 lists the federal- and state-listed species potentially found in the study area based on the USFWS online IPaC System and CPW threatened, endangered, and state special concern species.

Table 18. Federal- and State-Listed Species and their Potential to Occur

Species	Status ¹	Habitat Requirements	Potential for Occurrence in the Environmental Study Area
Birds			
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	SC	Widespread species that nests and roosts in large trees. Forages near water bodies with abundant prey and large trees for perching.	May occur. No known nest sites within project corridor; however, suitable summer and winter habitat is present on south end of Environmental Study Area along Platte River and McLellen Reservoir (CPW, 2020b).
Least Tern* (<i>Sterna antillarum</i>)	FE, SE	Reservoirs, lakes and rivers with bare, sandy shorelines for nesting and foraging.	Unlikely to occur. No suitable habitat in Environmental Study Area; however, downstream impacts could occur.
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	FT, ST	Occurs at elevations below 9,100 feet in large steep canyons with exposed cliffs and dense old growth mixed coniferous forests.	Unlikely to occur. Suitable steep canyon habitat does not occur in the Environmental Study Area.
Whooping Crane* (<i>Grus Americana</i>)	FE, SE	Mid-river sandbars, wet meadows, and reservoir edges along the Platte River in Nebraska.	Unlikely to occur. No suitable habitat in Environmental Study Area; however, downstream impacts could occur.
Piping Plover* (<i>Charadrius melodus</i>)	FT, ST	Reservoirs, lakes and rivers with bare, sandy shorelines with pebbles for nesting and foraging.	Unlikely to occur. No suitable habitat in Environmental Study Area; however, downstream impacts could occur.
Burrowing owl (<i>Athene cunicularia</i>)	ST	Prairie dog colonies are primarily used by the owl for nesting and hunting. The owl is a migrant that can arrive in March and is typically migrating south by October.	May occur. Suitable habitat is present in black-tailed prairie dog towns located within the Environmental Study Area.
Mammals			
Preble's meadow jumping mouse (<i>Zapus hudsonius preblei</i>)	FT, ST	Occurs along Front Range of Colorado along permanent or intermittent streams in areas with herbaceous cover and adequate cover of shrubs and trees.	Unlikely to occur. Nearly all the project area is in Denver Block clearance zone. However, occupied habitat mapped is present immediately southwest of Environmental Study Area.
Black-tailed prairie dog (<i>Cynomys ludovicianus</i>)	SC	Habitat consists of intermixed shrublands, sagebrush habitat, and/or shortgrass and mixed grass prairie.	Known to occur. Colonies are located near the US 85/C-470 junction and the area immediately north of W. County Line Road between US 85 and the railroad tracks.
Fish			
Greenback cutthroat trout	FT	Cold, clear, gravelly headwater streams and mountain lakes.	Unlikely to occur. No suitable habitat in Environmental Study Area.

Table 18. Federal- and State-Listed Species and their Potential to Occur

Species	Status ¹	Habitat Requirements	Potential for Occurrence in the Environmental Study Area
(<i>Ancorhynchus clarki stomias</i>)			
Pallid sturgeon* (<i>Scaphirhynchus albus</i>)	FE	Inhabits large, silty rivers with a diversity of depths and velocities formed by braided channels, sand bars, sand flats and gravel bars.	Unlikely to occur. No suitable habitat in Environmental Study Area; however, downstream impacts could occur.
Plants			
Western Prairie Fringed Orchid* (<i>Platanthera praeclara</i>)	FE	Occurs in mesic to wet unplowed tallgrass prairies and meadows but have also been found in old fields and roadside ditches in Nebraska	Unlikely to occur. No suitable habitat in Environmental Study Area; however, downstream impacts could occur.
Ute ladies' tresses orchid (<i>Spiranthes diluvialis</i>)	FT	Sub-irrigated alluvial soils along streams; open meadows on floodplains including riparian areas.	Unlikely to occur. No known suitable open meadows or floodplains in the project area. Improvements along Big Dry Creek or the various gulches in the Environmental Study Area may require surveys after consultation with USFWS. The entirety of the South Platte River riparian zone from C-470, through the Environmental Study Area, and to E. 168th Avenue is within the South Platte River Block Clearance Zone for the Ute ladies' tresses orchid.
Amphibians			
Northern leopard frog (<i>Rana pipiens</i>)	SC	Suitable breeding habitat found in streams, natural lakes and ponds, glacial kettles, stock ponds and reservoirs, and marshes and wetlands. This species overwinters underwater.	May occur. Suitable habitat may occur in riparian habitat adjacent to Environmental Study Area.
Common garter snake (<i>Thamnophis sirtalis</i>)	SC	Wetlands, ponds, and the edges of streams	May occur. Suitable habitat may occur in riparian habitat adjacent to Environmental Study Area.

Source: USFWS 2020; CPW, 2020a and 2020b.

*Species potentially impacted by Platte River system water depletions.

¹Status Codes: FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened, SC = State Special Concern.

5.4.5.1 *Platte River Species*

The five downstream species listed in Table 18 do not occur in the Environmental Study Area but are included because they can be affected by water depletions from the South Platte River downstream. These five species include the interior Least Tern, pallid sturgeon, Piping Plover, Whooping Crane, and western prairie fringed orchid.

Nesting and foraging habitat for raptors is present along gulches and lakes adjacent to Environmental Study Area. Bridges and other structures in study area may contain swallow nests.

CPW identifies the Platte River greenbelt as a mule deer limited use area, and the entire Environmental Study Area is identified as mule deer overall range (CPW, 2020b). Mule deer likely cross the highway in the Environmental Study Area to access green spaces on either side of Santa Fe Drive. CDOT recently installed 8-foot-tall wildlife fencing and a wildlife underpass-crossing in the design of the C-470 Bridge over the South Platte River immediately west of Santa Fe Drive. Deer are known to use this underpass to travel to the north and south of C-470 in areas adjacent to the west side of the Environmental Study Area.

5.4.6 Recommendations

The Environmental Study Area is located in an urban, developed, and commercial area; wildlife that is found in the area is expected to be tolerant of human activity. Wildlife habitat in the Environmental Study Area is limited because of the transportation corridor and high human disturbance, but the riparian areas along the Platte River provide a movement corridor and foraging habitat for wildlife.

During NEPA, a biological survey of special status species and raptor nests will be required. Prairie dog colonies will need to be mapped along the corridor. Coordination with the USFWS and CPW will be necessary to determine if other surveys are required for the NEPA process. CDOT's Statewide Impact Finding Tables (SWIFT) should be used to determine the potential for habitat early in the planning process.

Outside of the South Platte River Block Clearance Zone for the Ute ladies' tresses orchid, a presence/absence survey may be required during NEPA to determine if Ute ladies'-tresses orchid are present in suitable habitat such as wetlands and riparian areas. If required, these surveys must be scheduled to coincide with the blooming period of known nearby populations in coordination with the USFWS. Coordination with the USFWS and CPW will be required to determine potential impacts and mitigation for impacted Ute's ladies'-tresses orchid and/or habitat.

If a recommended future project is to receive federal funding administered by CDOT, impacts to federally listed downstream species listed in Table 18 will be managed through an existing Programmatic Biological Assessment between CDOT and USFWS. The Programmatic Biological Assessment has been extended through 2032 and addresses the following species:

Least Tern (interior population), pallid sturgeon, Piping Plover, western prairie fringed orchid, and the Whooping Crane.

If construction is planned to occur during the primary nesting season for migratory birds in Colorado (typically February 1 through August 31), a qualified biologist will resurvey the study area to verify if any active nests are present. If no active nests are present, then vegetation can be removed. However, if active migratory bird or raptor nests are identified and cannot be avoided by construction activities, the USFWS field office will be contacted to help determine the appropriate mitigation action. Coordination with the USFWS and CPW will be necessary to determine if other surveys are required prior to construction.

5.5 Parks, Trails and Open Space, and Wildlife and Waterfowl Refuges

5.5.1 Brief Description of Resource Studied

Recreational resources, including parks, trails and open space areas, and wildlife and waterfowl refuges are important community assets that provide environmental, aesthetic, and recreational benefits. Additionally, these recreational resources may be eligible for protection under Section 4(f) and Section 6(f). Section 4(f) properties include publicly owned public parks, recreation areas, and wildlife or waterfowl refuges, or any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places. Although not explicitly mentioned in the regulation, trails/multiuse paths, and open space areas qualify as Section 4(f) resources if they are publicly owned; and their purpose is for park, recreation, or refuge activities. Section 5.11, *Historic Resources* describes historic resources that may be subject to Section 4(f).

Section 3.8 *Bicycle and Pedestrian Facilities* of this report provides additional information about existing pedestrian and bicycle facilities, including those that may be eligible for protection under Section 4(f).

Section 6(f) properties include public outdoor recreation areas acquired or developed with funds from the Land and Water Conservation Fund (CDOT, 2017).

5.5.2 Agencies Involved

- Federal Highway Administration
- U.S. Department of Interior
- National Park Service
- Colorado Department of Transportation
- Agencies owning or administering the resources:
 - Colorado Parks and Wildlife
 - South Suburban Parks and Recreation District
 - Arapahoe County Open Spaces
 - Arapahoe County Community College
 - City of Littleton
 - City of Englewood

- o City and County of Denver

5.5.3 Relevant Regulations, Guidance, Studies, and Plans

Section 4(f) was created when the USDOT was formed in 1966. It is codified in Title 49 U.S.C. Section 303 [Section 4(f) of the USDOT Act of 1966] and Title 23 U.S.C. Section 138, and in the implementing regulations 23 Code of Federal Regulations (CFR) 774. It states:

“The Secretary shall not approve any program or projectwhich requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site of national, State, or local significance as so determined by such officials unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use.”

Section 6(f)(3) of the Land and Water Conservation Fund Act of 1965 contains provisions to protect properties that are purchased or improved with grants from the Land and Water Conservation Fund. Section 6(f) applies to all transportation projects that could involve possible conversion of the use of these public outdoor recreational properties (CDOT, 2017).

Additional plans referenced include:

- *I-25 and Broadway Station Area Plan* (City and County of Denver, 2016).
- *South Platte Connections Study* (Arapahoe County Open Spaces, 2019).

5.5.4 Data Collected/Methodology

Data was collected from the DRCOG Parks and Open Space Layer (2018a), DRCOG Bicycle Facility Inventory Layer (2018b), and Colorado Trail Explorer tool (CDNR with CPW, 2020). The South Suburban Parks and Recreation District Parks Locator Tool (South Suburban Parks and Recreation District, 2020) and ArapaMap (Arapahoe County Assessor’s Office, 2020) were also used to supplement the GIS data to identify resource managers and ownership, as applicable. This data was used to identify resources that may be eligible for protection under Section 4(f). Parks, open space areas, and trails that are within the Environmental Study Area were identified.

Planned public parks, recreation areas, or wildlife and waterfowl refuges may also be eligible for protection under Section 4(f). CDOT reviewed local agency planning documents and coordinated with local agency planning departments to determine what public parks, recreation areas, or wildlife and waterfowl refuges are planned within the Environmental Study Area. The *I-25 and Broadway Station Area Plan* (City and County of Denver, 2016) and *South Platte Connections Study* (Arapahoe County Open Spaces, 2019) list planned projects that may be eligible for protection under Section 4(f).

Properties subject to projection under Section 6(f) were identified using CDOT's Online Transportation Information System (CDOT, 2020f) and follow up coordination with Colorado Parks and Wildlife to verify property boundaries in September 2019.

5.5.5 Findings/Results

For the *Santa Fe PEL Study (C-470 to I-25)*, both multiuse paths and trails are referred to as multiuse paths. No wildlife or waterfowl refuges were identified, although some of the open space areas and greenways contain natural areas that may be suitable for wildlife or waterfowl.

Table 19 lists the existing and planned parks and open space areas within the Environmental Study Area that may be eligible for protection under Section 4(f) and identifies which are subject to Section 6(f). The Vanderbilt Park Section 6(f) property includes two parcels that are not existing or planned parks. These parcels are planned for future development and will no longer be protected by Section 6(f) in the near future. The Section 6(f) conversion parcels are shown in Figure 61. Figure 61 through Figure 63 show the locations of the resources listed in Table 19.

Table 19. Existing and Planned Parks and Open Space Areas

Resource Name (listed from south to north)	Resource Description	Owner/Manager	Immediately Adjacent to Santa Fe Drive or Major Cross Street(s) (Yes/No)?
Habitat Park ^A	Open Space	City and County of Denver	Yes
Vanderbilt East (Planned) ^A	Community Park	City and County of Denver	Yes
Vanderbilt Park ^A	Community Park	City and County of Denver	Yes
Overland Pond Park ^A	Community Park	City and County of Denver	Yes
Aqua Golf	Recreation Area	City and County of Denver	Yes
Overland Municipal Golf Course	Golf Course	City and County of Denver	Yes
Frontier West ^A	Community Park	City and County of Denver	No
Grant Frontier Park ^A	Community Park	City and County of Denver	No
Depot and Community Garden	Community Garden	City of Englewood	Yes
Cushing Park	Community Park	City of Englewood	Yes
Little Dry Creek Open Space	Open Space	City of Englewood	Yes
Englewood Recreation Center	Recreation Center	City of Englewood	Yes
Broken Tee Golf Course ^A	Golf Course	City of Englewood	Yes
Bellevue Park ^B	Community Park	City of Englewood	No

Table 19. Existing and Planned Parks and Open Space Areas

Resource Name (listed from south to north)	Resource Description	Owner/Manager	Immediately Adjacent to Santa Fe Drive or Major Cross Street(s) (Yes/No)?
Creekside Experience	Open Space	South Suburban Parks and Recreation District	Yes
Oxbow Point	Greenway	City of Englewood	No
Littleton City Hall Park	Complex	City of Littleton	No
Mary Carter Greenway ^B	Greenway	South Suburban Parks and Recreation District	Yes
Littleton Golf Course and Tennis Center	Golf Course/Tennis	South Suburban Parks and Recreation District	No
Arapahoe Community College South Lawn Frisbee Golf Course	Frisbee Golf Course	Arapahoe County Community College	No
Hudson Gardens	Community Park and Event Center	South Suburban Parks and Recreation District	Yes
Ridgewood Park Lower	Community Park	City of Littleton/South Suburban Parks and Recreation District	Yes
Reynold's Landing	Community Park	South Suburban Parks and Recreation District	Yes
Lee Gulch Overlook	Open Space	City of Littleton/South Suburban Parks and Recreation District	Yes
Ridgeview Park ^A	Community Park	City of Littleton/South Suburban Parks and Recreation District	No
Littleton Open Space (Mineral Avenue)	Open Space	City of Littleton	Yes
South Platte Park and Carson Nature Center	Park, Reservoir, Lakes, Open Space, Greenway, and Nature Center	City of Littleton/South Suburban Parks and Recreation District	Yes
Chatfield State Park ^A	State Park and Lake	Colorado Parks and Wildlife	No

^A Resource is subject to Section 6(f).

^B A sub area within the resource is subject to Section 6(f).

Figure 61. Existing and Planned Parks and Open Space Areas and Multiuse Paths (1 of 3)

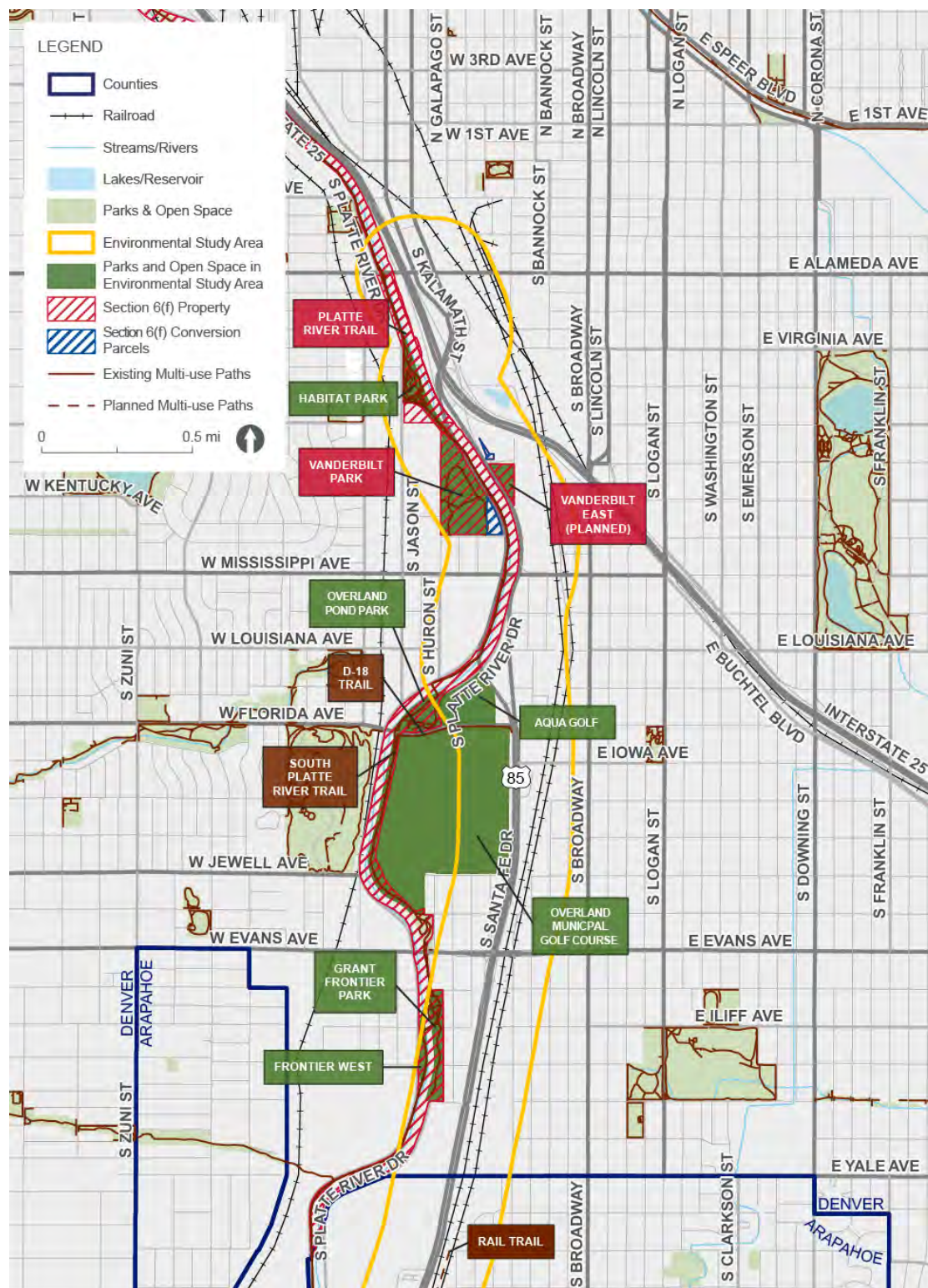


Figure 62. Existing and Planned Parks and Open Space Areas and Multiuse Paths (2 of 3)

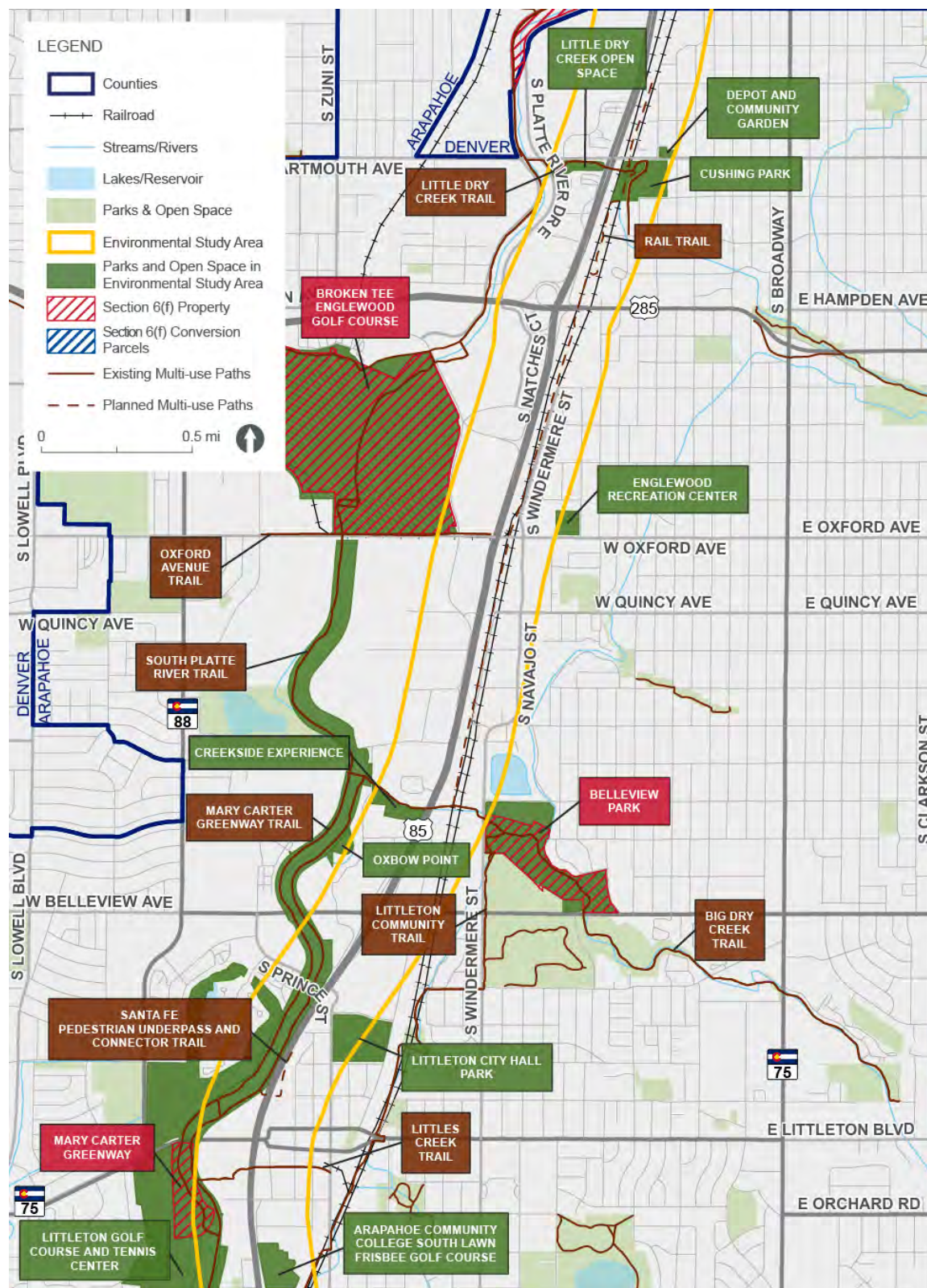


Figure 63. Existing and Planned Parks and Open Space Areas and Multiuse Paths (3 of 3)



Table 20 lists the existing and planned multiuse paths that may be eligible for protection under Section 4(f) and identifies which are subject to Section 6(f). These multiuse paths are detached facilities and do not share a roadway with automobile traffic, except at crossings. Figure 61 through Figure 63 show the locations of the resources listed in Table 20.

Table 20. Existing and Planned Multiuse Paths

Resource Name (listed from south to north)	Resource Description	Owner/Manager	Crosses Santa Fe Drive or Major Cross Street(s) (Yes/No)?
South Platte River Trail ^A	Paved Multiuse Path	South Suburban Parks and Recreation District, and City and County of Denver	Yes
D-18 Trail	Paved Roadside Path	City and County of Denver	No
Little Dry Creek Trail	Paved Multiuse Path	City of Englewood	No
Oxford Avenue Trail	Paved Roadside Path	Arapahoe County Open Spaces	No
Big Dry Creek Trail	Paved Multiuse Path	City of Englewood and South Suburban Parks and Recreation District	Yes
Littleton Community Trail	Unpaved Multiuse Path	South Suburban Parks and Recreation District	Yes
Littles Creek Trail	Paved Multiuse Path	City of Littleton	Yes
Rail Trail (Planned)	Multiuse Path	City of Englewood	Yes
Santa Fe Pedestrian Underpass and Connector Trail (Planned)	Underpass and Connector Path	City of Littleton	Yes
Lee Gulch Trail	Unpaved Multiuse Path	South Suburban Parks and Recreation District	Yes
Reynold's Landing Trail and Trailhead	Paved Roadside Path	South Suburban Parks and Recreation District	No
Jackass Hill Trail Connection (Planned)	Connector Path	City of Littleton	No
Mineral Trail	Paved Multiuse Path	South Suburban Parks and Recreation District	Yes
Mary Carter Greenway Trail ^B	Paved Multiuse Path	South Suburban Parks and Recreation District	Yes
C-470 Bikeway	Paved Multiuse Path	Highlands Ranch Metro District	Yes

^A Resource is subject to Section 6(f).

^B A sub area within the resource is subject to Section 6(f).

5.5.6 Recommendations

As shown in Figure 61 through Figure 63 and listed in Table 19 and Table 20, there are several recreational resources within the Environmental Study Area that could be impacted by future transportation improvements to the Santa Fe Drive corridor. Resources that are adjacent to or cross Santa Fe Drive or major cross streets are more likely to require additional analysis during the NEPA process, under Section 4(f) and Section 6(f). The purpose of Section 4(f) and Section 6(f) is to preserve eligible resources, so avoidance should always be considered as a first step during project planning. If a project doesn't avoid Section 4(f) and Section 6(f) properties, each has a process that must be followed to demonstrate and document that appropriate steps to avoid the resource, minimize harm to each resource, mitigate for impacts that do occur, and coordination with the officials with jurisdiction has occurred, as required.

To avoid delays, early coordination with applicable agencies and stakeholders should occur at the onset of preliminary design and NEPA, and continue through the alternatives selection process so that concurrence can be achieved through the Section 4(f) and Section 6(f) processes as efficiently as possible. FHWA is coordinated with for Section 4(f); CPW and the National Park Service and US Department of Interior are coordinated with for Section 6(f). Project schedules should account for the Section 4(f) and Section 6(f) processes, which have agency and public review requirements and can lengthen the project clearance schedule.

5.6 Air Quality

5.6.1 Brief description of Resources Studied

Air quality issues are considered in project planning and NEPA analyses to determine regional and local transportation conformity requirements and to be considered as part of overall impacts on communities. Both mobile source and stationary source air borne pollution can effect natural resources and human health.

5.6.2 Agencies Involved

- Federal Highway Administration
- U.S. Environmental Protection Agency
- Colorado Department of Transportation
- Air Pollution Control Division of the Colorado Department of Public Health and Environment
- Denver Regional Council of Governments
- Local agencies

5.6.3 Relevant Regulations, Guidance, Studies, and Plans

Air quality was assessed to determine current attainment/nonattainment/maintenance status of the Environmental Study Area with respect to National Ambient Air Quality Standards (NAAQS). Air quality must be considered in project development activities in accordance with the Transportation Conformity rules in 40 CFR 51 and 93, Subpart A. Those requirements apply to any highway or transit project funded or approved by the U.S. Department of Transportation and

by metropolitan planning organizations or other recipients of funds under Title 23 U.S.C. or the Federal Transit Laws (49 U.S.C. Chapter 53), including regionally significant projects.

Other applicable laws, regulations, guidance documents, and plans for air quality include:

- Clean Air Act
- National Ambient Air Quality Standards under 40 Code of Federal Regulations 50
- Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas, Environmental Protection Agency (EPA) Publication EPA-420-B-15-084 (November 2015)
- Guideline for Modeling Carbon Monoxide [CO] from Roadway Intersections, EPA Publication EPA-454/R-92-005 (November 1992)
- FHWA Memorandum: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents (October 18, 2016)
- Air Quality Project-Level Analysis Guidance (CDOT, 2019a)
- Colorado Air Quality Control Commission Regulation No. 10, Criteria for Analysis of Transportation Conformity (2016)
- CO and particulate matter less than 10 microns in diameter (PM₁₀) August 2019 Conformity Determination for the DRCOG Fiscally Constrained Element of the 2040 Metro Vision Regional Transportation Plan (DRCOG, 2015) and the 2020-2023 Transportation Improvement Program (Adopted August 21, 2019) (DRCOG, 2019c)
- EPA on-line Green Book website (based on updates through June 30, 2020) (EPA, 2020b)
- CDOT is also developing a Clean Transportation Plan to accomplish this goal:

Reduce pollution in our air and congestion on our roads by reducing vehicle miles traveled (VMT), greenhouse gas emissions, and ozone causing emissions from the transportation sector, through multimodal options, by one percent per capita by June 30 2021, from the pre-COVID-19 estimated calendar year 2019 baseline of 9,300 VMT per capita, 4.2 tons of CO₂e per capita, 2.0 pounds of VOC per capita, and 9.5 pounds of NO_x per capita.

Major strategies for achieving this goal are to:

- Update National Environmental Policy Act (NEPA) processes and project selection criteria to incorporate Clean Transportation goals.
- Increase the percentage of Coloradans commuting to work using multimodal options, including those utilizing telecommuting options, from 25 percent in 2018 to 30 percent in 2021.

5.6.4 Data Collected/Methodology

Air quality was assessed within the Environmental Study Area, which is defined as an approximate 1,000-foot buffer from the Santa Fe Drive centerline within the project limits. The Environmental Study Area extends from northwestern Douglas County, through Arapahoe County and into Denver County. The Environmental Study Area is within the planning area of the DRCOG metropolitan planning organization.

Information on the latest National Ambient Air Quality Standards (NAAQS) nonattainment, maintenance, and attainment designations for the Environmental Study Area was obtained from the EPA on-line Green Book website (based on updates through June 30, 2020) (EPA, 2020b), which provides listings of NAAQS compliance status by state and county (EPA, 2020b).

5.6.5 Findings/Results

The status of the area within the Environmental Study Area with respect to attainment of current NAAQS for transportation-related pollutants is summarized in Table 21. The air pollutants listed are those for which there are requirements under the Transportation Conformity rules in 40 CFR 93, Subpart A.

Table 21. NAAQS Attainment Status

Portion of Santa Fe Drive Corridor	Pollutant/Standard	Status Designation
Arapahoe, Denver, and Douglas County Portions	Carbon Monoxide (CO) 1971 NAAQS	Maintenance
	Ozone 2008 NAAQS	Nonattainment (serious)
	Ozone 2015 NAAQS	Nonattainment (marginal)
	PM _{2.5} 2006 & 2012 NAAQS	Attainment
	PM ₁₀ 1987 NAAQS	Maintenance

Maintenance status means that the area was in nonattainment status and is within the 20-year planning period subsequent to demonstrating compliance with the applicable NAAQS for the pollutant.

NAAQS = National Ambient Air Quality Standards

PM₁₀ = particulate matter less than 10 microns in diameter

PM_{2.5} = particulate matter less than 2.5 microns in diameter

5.6.6 Recommendations

Because the Environmental Study Area is in maintenance status for PM₁₀, alternatives considered would need to be assessed during NEPA to determine the need for a PM₁₀ hot-spot analysis based on whether there is a significant increase in diesel vehicle traffic associated with the improvements (40 CFR 93.123(b)). Similarly, because the Environmental Study Area is in maintenance for CO, Transportation Conformity rules also require a CO hot-spot analysis if the project-affected intersection operates at a level of service D or worse, or will change to D or

worse due to the project. Level of service is the measure of a roadway's ability to handle traffic demand and is defined from A to F in order of decreasing operation quality by the Transportation Research Board's *Highway Capacity Manual* (TRB, 2010).

The Environmental Study Area is in nonattainment status for ozone, therefore if a proposed project is already included in the DRCOG-approved plans and transportation improvement program listings during NEPA, it will be deemed to conform for ozone purposes under the Transportation Conformity rules.

Mitigation for long-term and construction-related air quality impacts should be developed on a project-to-project basis during NEPA, as applicable. Air quality mitigation measures for construction activities typically involve dust control measures and ensuring that equipment is properly maintained to eliminate any continuously visible exhaust emissions.

Additionally, CDOT's Clean Transportation Goal should be considered during alternatives analysis and NEPA. Updated CDOT-specific requirements during NEPA should be incorporated into projects, and projects should be consistent with the future CDOT Clean Transportation Plan.

5.7 Traffic Noise

5.7.1 Brief Description of Resource Studied

Noise is defined as unwanted sound and includes any sound that is generally considered annoying or offensive. Noise-sensitive receptors include locations where highway traffic noise may be detrimental to enjoyment and functional use of a property. Traffic noise levels generally increase as a result of transportation projects that accommodate increased traffic volumes or locate roadway facilities closer to noise sensitive receptors, if it is not mitigated.

5.7.2 Agencies Involved

- Federal Highway Administration
- Colorado Department of Transportation
- Local agencies

5.7.3 Relevant Regulations, Guidance, Studies, and Plans

- Title 23 CFR §772–Procedures for Highway Abatement of Traffic Noise and Construction Noise
- FHWA Highway Traffic Noise Analysis and Abatement Policy and Guidance (FHWA, 2011)
- CDOT Noise Analysis and Abatement Guidelines (CDOT, 2015b)
- CDOT National Environmental Policy Act Manual, Version 6 (CDOT, 2020g)

5.7.4 Data Collected/Methodology

The traffic noise study area is defined as a 500-foot buffer from the edge of pavement on either side of Santa Fe Drive and is used to consider noise-sensitive resources adjacent to the corridor, in accordance with CDOT *Noise Analysis and Abatement Guidelines* (CDOT, 2015b). A desktop review of aerial imagery was completed to collect data on adjacent land uses. GIS data sets from local municipalities, including Denver County (City and County of Denver, 2020b), Arapahoe County (Arapahoe County, 2020c), and Douglas County (Douglas County, 2020), with information on land use were also consulted.

Activity Categories are categories of land use adjacent to a roadway project that must be assessed for noise. These categories include land uses designated as A through G in the CDOT *Noise Analysis and Abatement Guidelines* (CDOT, 2015b). For this analysis, each existing land use that fell within Activity Categories B, C, and E was identified. Land uses that were clearly under construction were also included. Activity Categories A, D, F and G were not considered.² The noise-sensitive areas in Activity Categories B, C, and E are summarized in Table 22 and displayed in Figure 64 through Figure 66.

Table 22. CDOT Noise Abatement Criteria and Noise-Sensitive Areas

Location	Noise-Sensitive Area Summaries	Potential Noise Impact and Abatement Areas
Land Use Category B—66 dBA* Exterior: Residential		
Douglas County	Medium-density homes	Medium-density homes located: <ul style="list-style-type: none"> Between W. County Line Road and C-470
Arapahoe County	Medium- and high-density homes, mobile homes	Apartments, mobile homes, and single-family homes are concentrated: <ul style="list-style-type: none"> Between W. Amherst Avenue and US 285 (W. Hampden Avenue) Between W. Belleview Avenue and W. Main Avenue Between W. Church Avenue and W. Lake Avenue Between W. Ridge Road and W. County Line Road
Denver County	Medium- and high-density homes	Apartments, townhomes and single-family homes are concentrated: <ul style="list-style-type: none"> Between W. Mississippi Avenue and W. Louisiana Avenue Between E. Mexico Avenue and W. Harvard Avenue

² Activity Categories A, D, F and G were not considered for the following reasons: A receptors are extremely rare and apply only to extraordinary special public needs where the existing environment is of a serene nature that needs to be preserved to allow the area to continue to serve its purpose, these land uses do not occur in the traffic noise study area. Activity Category D describes criteria for interior evaluations when all exterior analytical methods have been exhausted, these land uses do not occur in the traffic noise study area. Activity Categories F and G receptors are non-sensitive to traffic noise or undeveloped land uses, and are not considered noise sensitive.

Table 22. CDOT Noise Abatement Criteria and Noise-Sensitive Areas

Location	Noise-Sensitive Area Summaries	Potential Noise Impact and Abatement Areas
Land Use Category C—66 dBA* Exterior: Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.		
Douglas County	Parks and bikeway	Recreation areas are concentrated: <ul style="list-style-type: none"> Between W. County Line Road and Blakeland Drive
Arapahoe County	Parks, trails, community facilities, medical facilities, places of worship, public institutional structures, schools, cemeteries, and recreation areas	Parks and recreation areas are concentrated: <ul style="list-style-type: none"> Between W. Dartmouth Avenue and US 285 (W. Hampden Avenue) Between W. Layton Avenue and W. Chenango Avenue Between W. Belleview Avenue and W. Alamo Avenue Between W. Church Avenue and W. Davies Avenue Between W. Mineral Avenue and W. County Line Road
Denver County	Parks and recreation areas	Parks are concentrated: <ul style="list-style-type: none"> Between W. Virginia Avenue and W. Tennessee Avenue Between E. Louisiana Avenue and W. Jewell Avenue Between W. Iliff Avenue and E. Harvard Avenue
Land Use Category E—71 dBA* Exterior: Hotels, motels, time-share resorts, vacation rental properties, offices, restaurants/bars, and other developed lands, properties or activities not included in Categories A-D or F.		
Douglas County	N/A	N/A
Arapahoe County	Restaurants with outdoor seating	Restaurants with outdoor seating are concentrated: <ul style="list-style-type: none"> Between W. Prentice Avenue and W. Lake Avenue Between Brewery Lane and W. Davies Avenue
Denver County	Restaurants with outdoor seating	Restaurants with outdoor seating dispersed throughout the corridor

Source: CDOT Noise Analysis and Abatement Guidelines (CDOT, 2015b)

*A-weighted decibels, abbreviated dBA, are an expression of the relative loudness of sounds in air as perceived by the human ear.

Figure 64. Noise-Sensitive Areas in Noise Study Area (1 of 3)

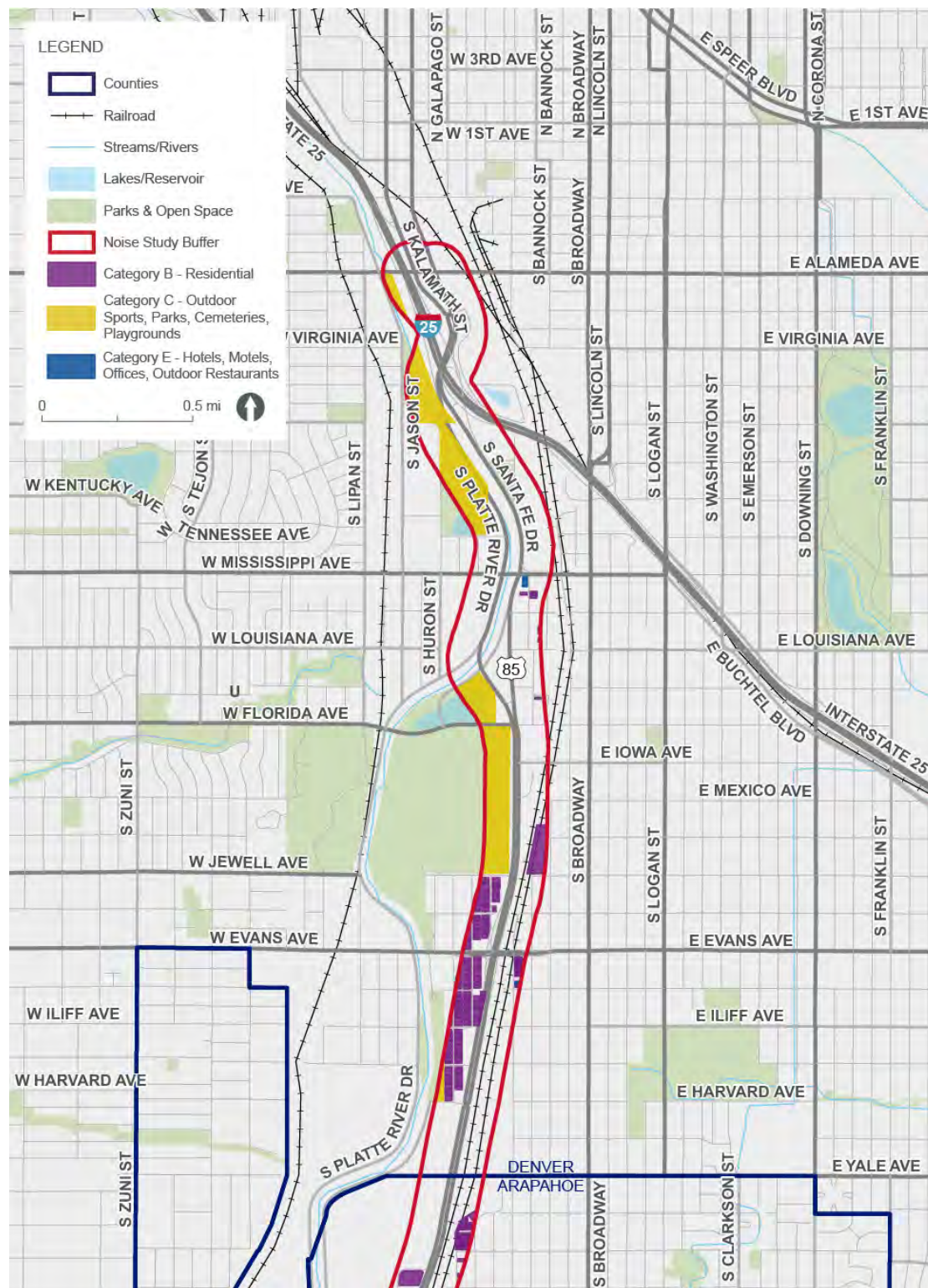


Figure 65. Noise-Sensitive Areas in Noise Study Area (2 of 3)

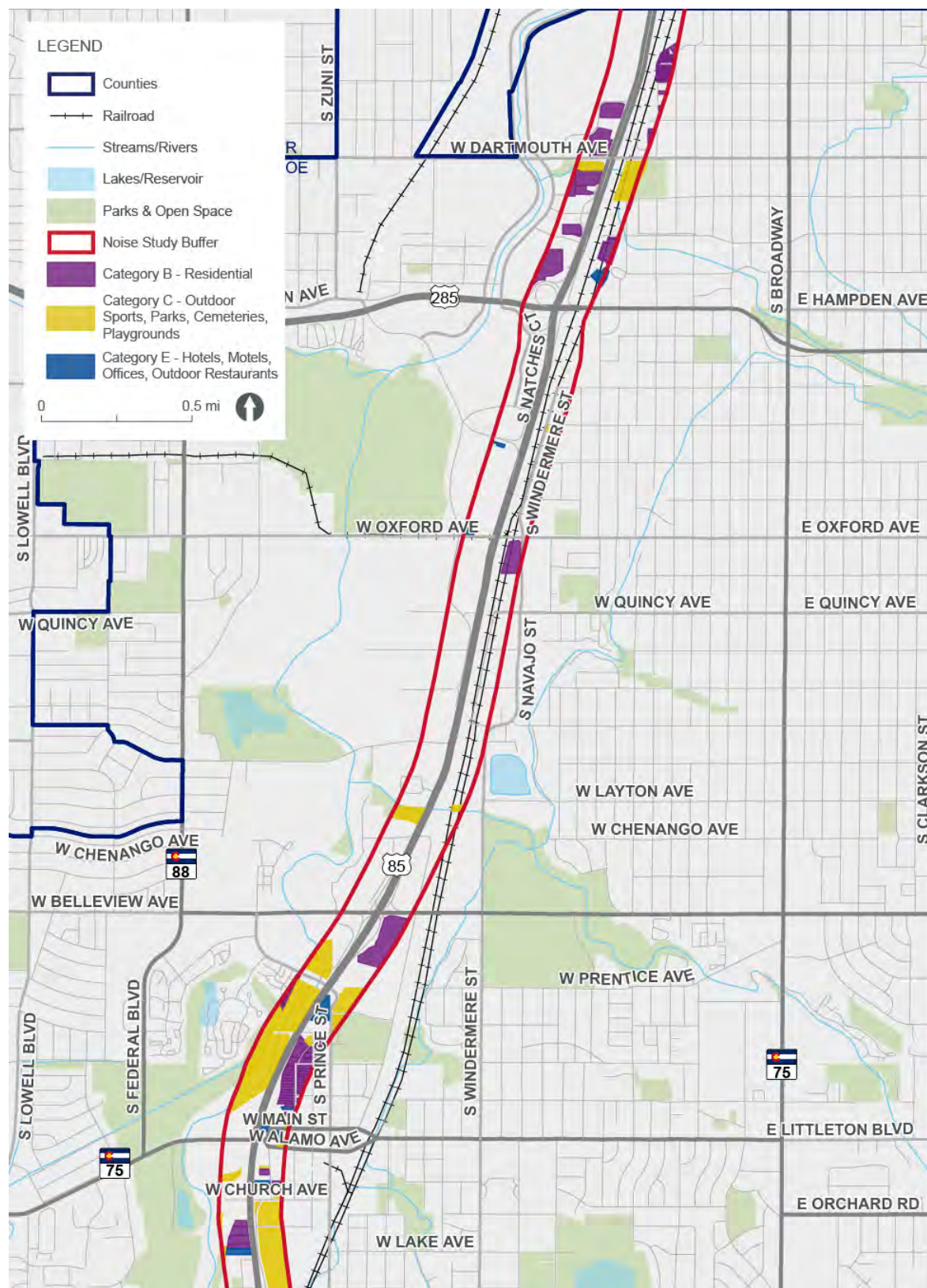
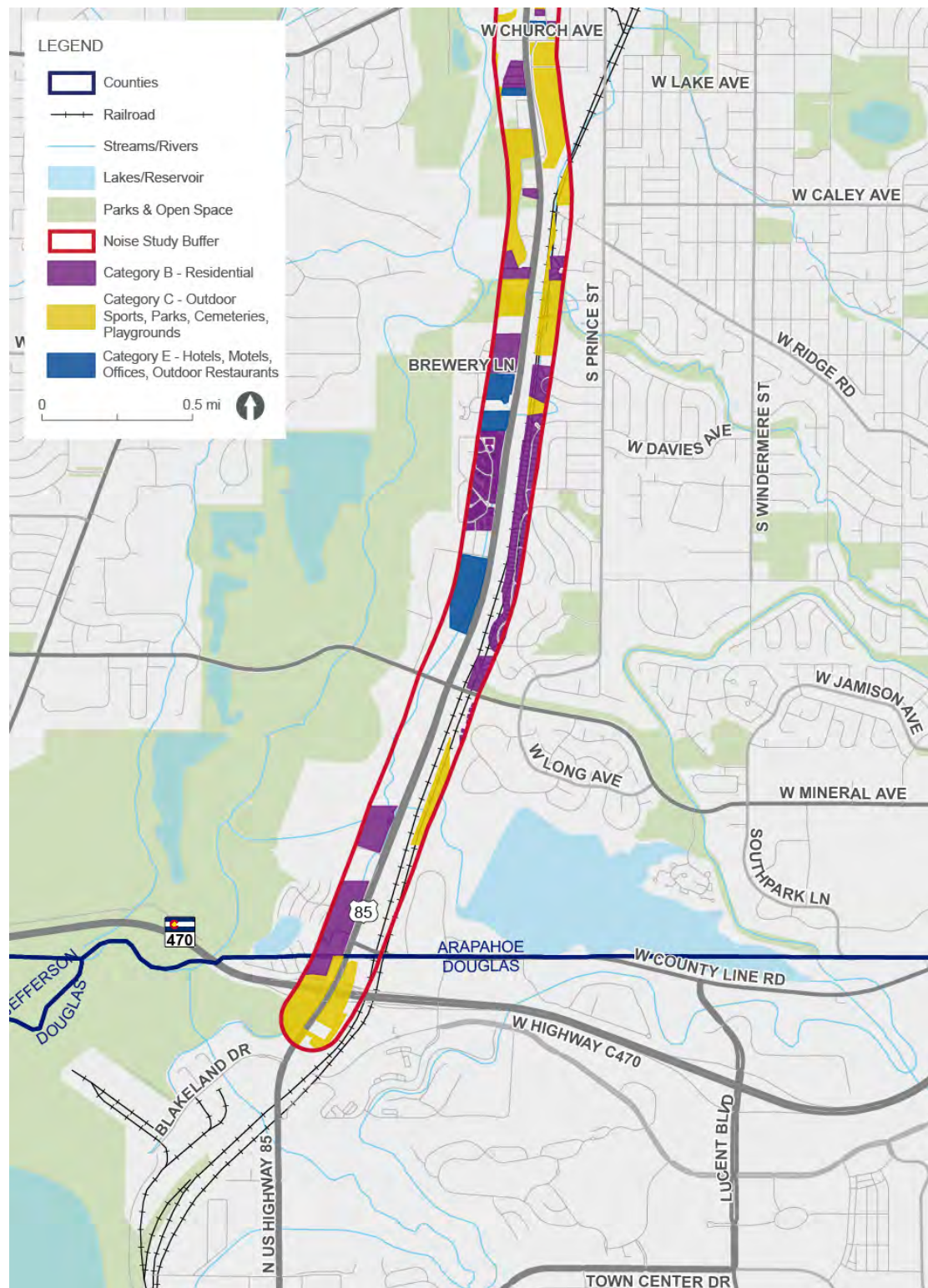


Figure 66. Noise-Sensitive Areas in Noise Study Area (3 of 3)



5.7.5 Findings/Results

Results of the review indicated 844 parcels in the traffic noise study area with sensitive land uses. Of the identified parcels, 753 were categorized as Activity Category B, 77 were categorized as Activity Category C, and 14 were categorized as Activity Category E (Table 22).

5.7.6 Recommendations

An alternatives analysis should consider potential noise impact and abatement (mitigation) areas along the corridor, such as near parks and recreation areas, and medium- and high-density residential areas, including mobile homes. During NEPA, a traffic noise assessment will be required for all Type 1 projects (as defined in *CDOT Noise Analysis and Abatement Guidelines* [CDOT, 2015b]) to determine if the project would have impacts on sensitive receptors. A traffic noise impact is considered to occur when any noise-sensitive receptor is subjected to either 1) future noise levels that approach or exceed the Noise Abatement Criteria, or 2) future noise levels that substantially exceed the existing noise levels. Both of the above must be analyzed to adequately assess the noise impact of a proposed project. Qualified practitioners, as defined by the *CDOT Noise Analysis and Abatement Guidelines* (CDOT, 2015b), should conduct noise evaluations. NEPA requires a comparison of a proposed alternative (in the design year) and no-build/no-action scenario (in the design year) with a baseline (existing conditions) to evaluate potential changes in the traffic noise environment from the existing conditions.

Where possible, improvements should be made away from noise-sensitive properties to reduce the impacts from traffic noise. If NEPA analysis reveals that any noise-sensitive receptors will be impacted, CDOT will analyze the feasibility and reasonableness of noise abatement for the impacted receptors. For noise abatement (such as noise barriers) to be recommended, it must be both feasible and reasonable according to *CDOT Noise Analysis and Abatement Guidelines* (CDOT, 2015b).

Properties adjoining project construction may be exposed to noise from construction activities. Construction noise is temporary in nature. Typical best management practices will be incorporated into construction contracts where it is appropriate to do so.

5.8 Hazardous Materials

5.8.1 Brief Description of Resource Studied

The acquisition of property for right-of-way and potential construction disturbance requires the evaluation of hazardous material concerns to protect worker health and safety, to protect public health, to provide liability due diligence for the purchasing entity, and to improve the project alternatives analysis based on potential hazardous material impacts.

The *CDOT National Environmental Policy Act Manual, Version 6* (CDOT, 2020g) describes the term hazardous materials as an all-inclusive term for materials that are regulated as a solid waste, hazardous waste, and other materials contaminated with hazardous substances, radioactive materials, petroleum products, toxic substances, and pollutants.

5.8.2 Agencies Involved

- U.S. Environmental Protection Agency
- Federal Highway Administration
- Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division
- Colorado Department of Transportation
- Local agencies

5.8.3 Relevant Regulations, Guidance, Studies, and Plans

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980
- Resource Conservation and Recovery Act of 1976
- Title XIV of the Public Health Service Act (“Safe Drinking Water Act”) of 1974
- American Society for Testing and Materials (ASTM) Standard E1527-13 (ASTM, 2013), and E1528-14 (ASTM, 2014)
- CDOT National Environmental Policy Act Manual, Version 6 (CDOT, 2020g)
- CDOT Hazardous Materials Guidance (CDOT, 2018)

5.8.4 Data Collected/Methodology

The primary resource used to determine hazardous material recognized environmental conditions (REC) and potential environmental concerns (PEC) sites was a GeoSearch regulatory database search conducted May 2020 (GeoSearch, 2020). The database report provided links to the following government agency websites that were reviewed for applicable sites:

- EPA Superfund Search Tool: <https://cumulis.epa.gov/supercpad/cursites>
- EPA Enforcement and Compliance History: <https://echo.epa.gov>
- CDPHE Brownfields Program: <https://www.colorado.gov/pacific/cdphe/brownfields>
- Colorado Department of Labor and Employment Division of Oil and Public Safety Colorado Storage Tank Information System website:
https://opus.cdle.state.co.us/OIS2000/event_search.asp
- CDPHE Voluntary Cleanup and Redevelopment Program (VCRP):
<https://www.colorado.gov/pacific/cdphe/voluntary-cleanup>

The City of Littleton Public Works Department provided the following report that was reviewed and summarized: *Historical Summary and Assessment Skunk Hollow Proposed Water Quality Pond, Littleton, Colorado* (Apex Companies, LLC, 2019).

The GeoSearch database was assessed along Santa Fe Drive from C-470 to Alameda Avenue within the Environmental Study Area. The various federal, state, local, and tribal databases were researched according to the ASTM Practice E1527-13 standard search radii, which vary from the target property (Santa Fe Drive).

The *Santa Fe PEL Study (C-470 to I-25)* is focused on major hazardous material sites that may influence alternatives development or have major cost ramifications. Therefore, the following sites were not considered an environmental concern:

- Underground storage tank sites
- Aboveground storage tank sites
- Leaking underground storage tank sites
- Resource Conservation and Recovery Act hazardous material generator sites
- CDPHE VCRP no action determination (NAD) sites
- Dry cleaners
- Railroad tracks
- Electrical transformers
- Asbestos and lead-based paint sites
- Spill sites

For instance, there are 13 VCRA NAD sites within the River Point at Sheridan retail center located on the west side of Santa Fe Drive north of W. Oxford Avenue. All 13 of the sites have been granted NAD by the CDPHE. A NAD is given when the property owner indicates the existence of contamination that does not exceed state standards or contamination which does not pose an unacceptable risk to human health and the environment; or that contamination originates from a source on, adjacent or nearby and the entity responsible will be taking necessary action, if any, to address the contamination. For purposes of *Santa Fe PEL Study (C-470 to I-25)*, these sites are not considered major sites.

The major hazardous materials sites evaluated for *Santa Fe PEL Study (C-470 to I-25)* included large federally listed sites, corrective action sites, brownfield sites, designated VCRP sites, and historic landfills. Evaluation of these sites included site location within the Environmental Study Area, type of database listing, present and/or historical status of the site, and professional judgment.

The GeoSearch database listed 595 mapped site identification locations with a total of 1,426 separate database listings, as sites may have more than one database listing. Each mapped site identification location may also contain multiple site names and addresses due to historical name and address changes and address overlapping. Because of the high number of sites, only the sites within the Environmental Study Area were evaluated. This resulted in a total of 365 mapped site identification locations that were evaluated to determine if they contained REC or PEC sites.

5.8.5 Findings/Results

It was determined from the evaluation that 77 of the 365 mapped site identification locations are considered major REC or PEC sites, 42 of which are historic landfills. The major sites with the most potential to influence transportation project planning or implementation are listed in Table 23.

Table 23. Major Site with Most Potential to Influence Transportation Project Planning

Map ID	Site Name
1,7	Denver Radium Sites (multiple locations)
9, 30, 76, 179, 227, 264, 338, 357,	Former Gates Rubber Plant
3, 12, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 58, 59, 61, 80, 81, 113, 128, 133, 141, 154, 156, 163, 164, 181, 182, 197, 228, 236, 260, 271, 299, 312, 335, 365	Historic Landfills
9, 76, 87, 91, 160, 162, 179, 200, 225, 235, 240, 243, 248, 264, 326, 338, 343, 357, 359, 360,	Approved VCRA sites
91, 243	Past and Present RTD Maintenance Facilities
176	Shattuck Chemical Co, 1805 S Bannock St
65	Winslow and Davidson Construction, 3700 S Santa Fe
119	CDOT Project CXFCU (GF) 10-0085-1/Rons Tire, 3275 Santa Fe Dr/Fogel Property, 3273 S Santa Fe Dr/Fogel Drums, 3261 S Santa Fe Dr
160	Thomas Plating, 4645 & 4695 S Windermere/Thomas Plating Co Inc., 4695 S Windermere/Spill Incident 2018-0316, 4675 Windermere
200	Delaware/Evans, 2134 through a portion of 2170 S Delaware St/Medici Communities, 2140 S Delaware St Platte Chrome Site, 2220 S Delaware St, S Platte River on W, S Delaware on E/Former Power Engineering, 2220 S Delaware St
236	Alameda Catalytic Site, Alameda and South Platte River Drive
240	General Iron Works/Iron Works Village/General Iron Works II, 601 W. Bates Ave
245	Keogh & Co/Abandoned Cathode Ray Tubes, 1101 W. Dartmouth
252	Name Not Reported/Cedar Mountain Mulch Co, 4755 S Windermere St

Table 23. Major Site with Most Potential to Influence Transportation Project Planning

Map ID	Site Name
276	Parker Hannifin Corp/Wilkerson Ops, 1201 W. Mansfield Ave
293	Power Engineering Co, 2525 S Delaware St
338	837 th Army Air Force (AAF) Specialized Depot, Denver County
340	Happy Church, 455 S Platte River Dr
346	Evans Catalytic Site, Evans & Huron
350	Navajo Enterprises/Front Range Plating II, 4500 S Navajo St
363	Cherokee Solvents, 201 S Cherokee St
364	Tools For Bending/Dakota Ammonia, 194 W. Dakota Ave

The major REC or PEC sites may have contaminated soils and/or groundwater, and the landfill sites may also contain artificial fill and hazardous refuse, as well as methane gas. Appendix I includes a table with general Environmental Study Area conditions that may pose a hazardous material risk and summaries of environmental findings for each major site REC and PEC with a figure showing their locations. Figure 67 through Figure 69 show the major sites listed in Table 23 and Appendix I. Details on each site can be found in the GeoSearch database report in Appendix I.

5.8.6 Recommendations

Every CDOT project requires an Initial Site Assessment (ISA) Checklist/Form 881, a Modified Environmental Site Assessment (MESA), or a Phase I Environmental Site Assessment (ESA). CDOT requirements are based on ASTM standards E1527-13 and E1528-14, which provide requirements for conducting an ESA with all appropriate inquiries. Compliance with all appropriate inquiries will allow protection from potential liability under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as an innocent landowner, a contiguous property owner, or a bona fide prospective purchaser.

During NEPA, CDOT requires an ISA or a Phase I ESA for Categorical Exclusion projects or acquisition of properties with potential hazardous materials concerns for right-of-way. A MESA is required for an Environmental Assessment and an Environmental Impact Statement.

Based on MESA, ISA, or Phase I ESA findings, if a Phase II ESA (i.e., materials testing) and/or remediation activities are required there may be substantial delays for property acquisition or construction in the vicinity. Also, a Phase II ESA and remedial activities could require additional funding. These activities are associated with the acquisition of properties.

Figure 67. Major Sites with Most Potential to Influence Transportation Project Planning (1 of 3)

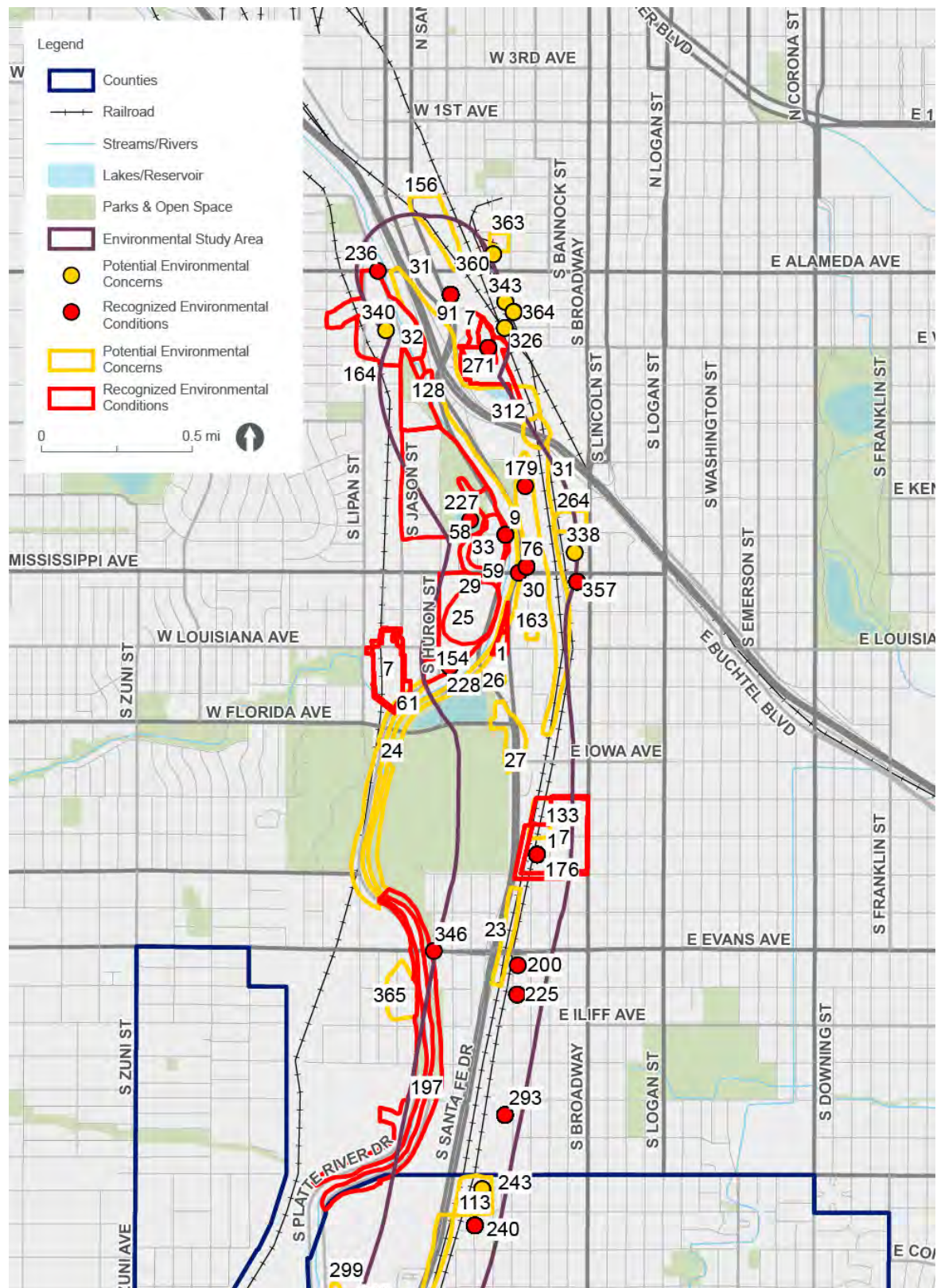


Figure 68. Major Sites with Most Potential to Influence Transportation Project Planning (2 of 3)

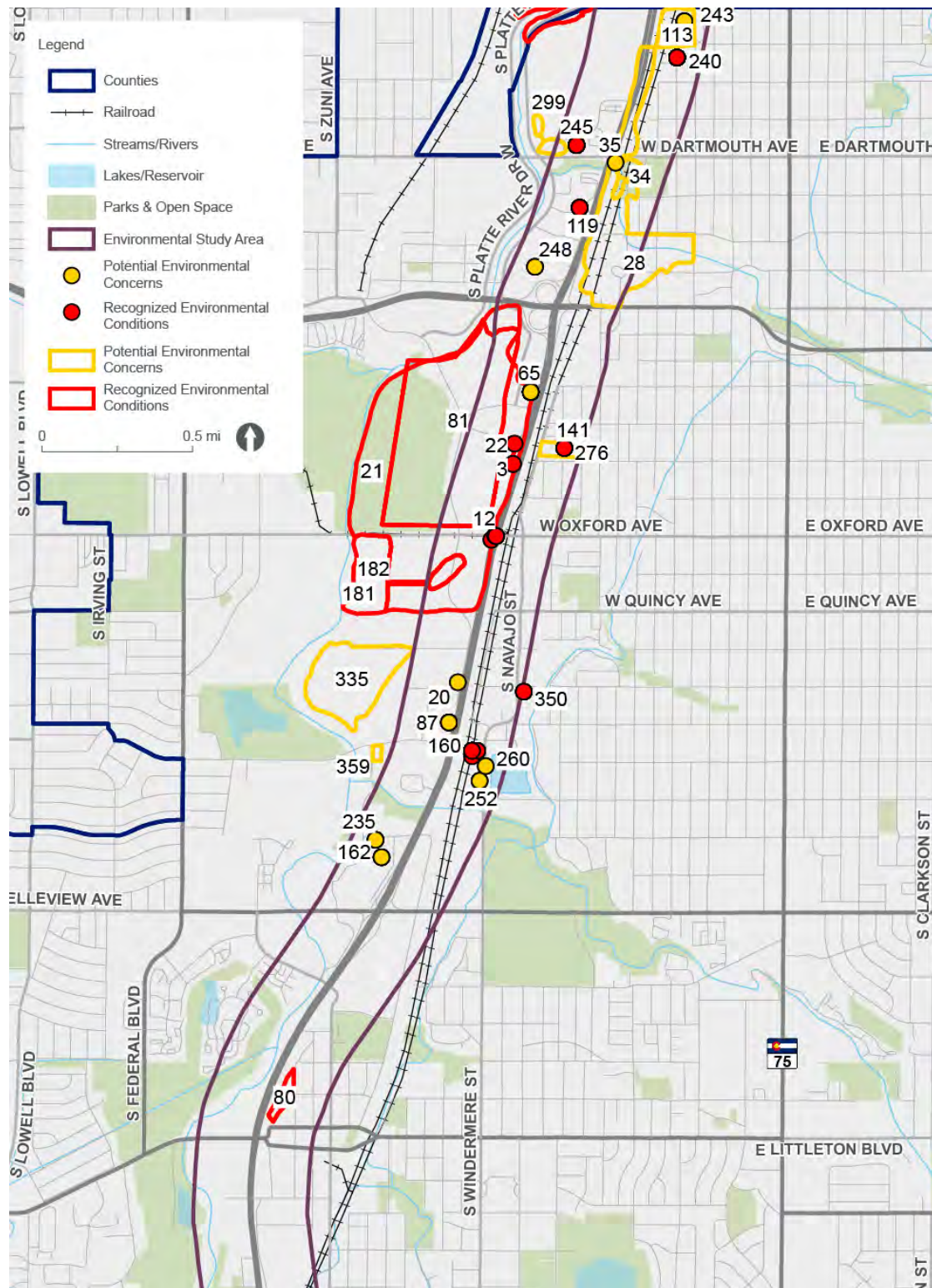
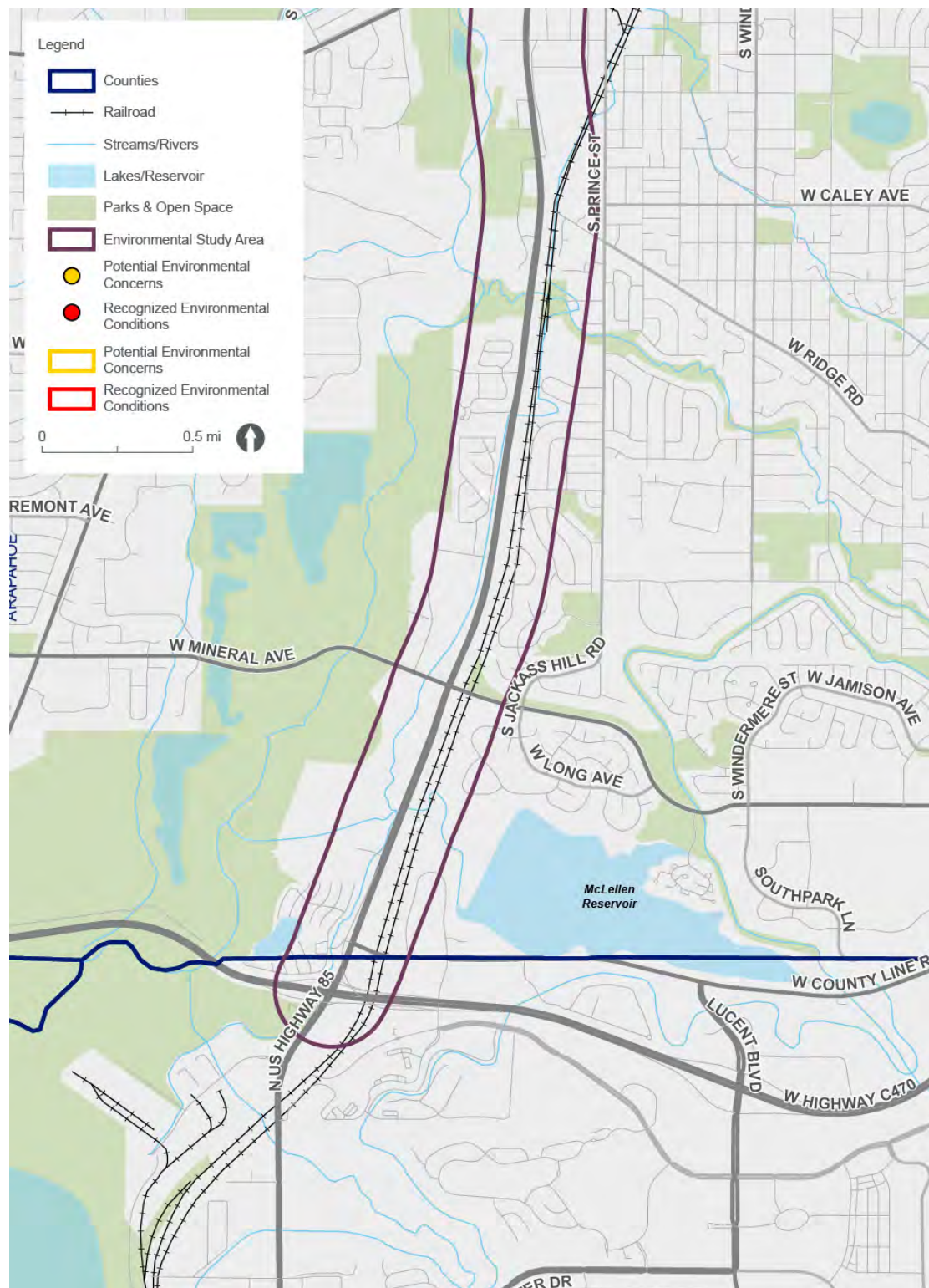


Figure 69. Major Sites with Most Potential to Influence Transportation Project Planning (3 of 3)



Hazardous materials concerns within the construction area will require the use of CDOT Standard Specification 250: Environmental, Health and Safety Management. A Materials Management Plan should also be used if construction activities are anticipated to encounter hazardous materials.

5.9 Environmental Justice

5.9.1 Brief Description of Resource Studied

Environmental justice analysis evaluates the impacts of programs, policies, and activities on low-income and/or minority populations to achieve an equitable distribution of benefits and burdens. FHWA and CDOT are required to identify and address disproportionately high and adverse human health and environmental effects on low-income and minority populations. FHWA and CDOT have established guidelines for identifying minority and low-income populations and community resources serving these populations, in addition to potential impacts and potential mitigation measures.

5.9.2 Agencies Involved

- Federal Highway Administration
- Colorado Department of Transportation
- U.S. Department of Housing and Urban Development
- Local businesses and community resources
- Local agencies

5.9.3 Relevant Regulations, Guidance, Studies, and Plans

Executive Order 12898 (1994) mandates that each federal agency develop an agency-wide environmental justice strategy that identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

Title VI of the Civil Rights Act of 1964 (as amended) protects persons from discrimination solely on the basis of race, color, and national origin.

Other applicable laws, regulations, and guidance documents for environmental justice include:

- FHWA Order 6640.23A on Environmental Justice (1994)
- Executive Order 13166 Improving Access to Services for Persons with Limited English Proficiency (2000)
- FHWA Guidance on Environmental Justice and NEPA (2011)
- U.S. Department of Transportation Order 5610.2(a) on Environmental Justice (2012)
- FHWA Environmental Justice Reference Guide (FHWA, 2015a)
- CDOT National Environmental Policy Act Manual, Version 6 (CDOT, 2020g)

5.9.4 Data Collected/Methodology

Environmental justice communities were identified for the Environmental Study Area, which is defined as 1,000 feet from the Santa Fe Drive centerline. The data is depicted at the U.S. Census block group level which is the lowest level geography available for this data. The U.S. Census Bureau, 2014-2018 American Community Survey (ACS) 5-Year Estimates data set was used (U.S. Census Bureau, 2018a and 2018b). The ACS is the largest source of small area statistics for social, economic, housing, and demographic characteristics and provides more recent data than the 2010 census. Percentages are calculated based on total populations and households in the census block groups.

5.9.4.1 Minority Population

The minority classification includes people who are Black, Hispanic or Latin, Asian American, American Indian or Alaska Native, or Native Hawaiian or Pacific Islander. A minority classification also includes other races (non-white and not previously listed) and those of two or more races. Hispanic or Latino heritage is accounted for as an ethnicity in the census data and is not listed as a racial category; this analysis took that into account to avoid double counting.

5.9.4.2 Low-Income Population

U.S. Census Bureau poverty definition, based on a set of income thresholds, was used to approximate the presence of low-income populations in the Environmental Study Area. In an environmental justice analysis completed during NEPA, the low-income definition is typically based on income limits set by the U.S. Department of Housing and Urban Development (HUD), and the study area is compared to the area medium income for the geographic area where it exists. The results of the low-income population evaluation completed for this study can be used as a guide during this PEL process to consider impacts to these protected populations with a more comprehensive low-income population analysis occurring during NEPA.

5.9.5 Findings/Results

The data indicate that the percent minority population by census block group in the Environmental Study Area range from 2 percent to 92 percent. While there are minority populations throughout the corridor, the review of preliminary mapping and data suggests there are few concentrations of minority populations that occur within the Environmental Study Area.

The percent low-income households by census block group range from 2 percent to 36 percent in the Environmental Study Area. Relative concentrations of low-income households (more than 15 percent of the households) can be found along the corridor in Denver County between W. Mississippi Avenue and W. Florida Avenue, in Arapahoe County between E. Yale Avenue and W. Oxford Avenue, and between W. Belleview Avenue and south of W. Ridge Road.

The minority population data is depicted in Figure 70 through Figure 72. Low-income population data is depicted in Figure 73 through Figure 75.

Figure 70. Minority Populations by Census Block Group (1 of 3)

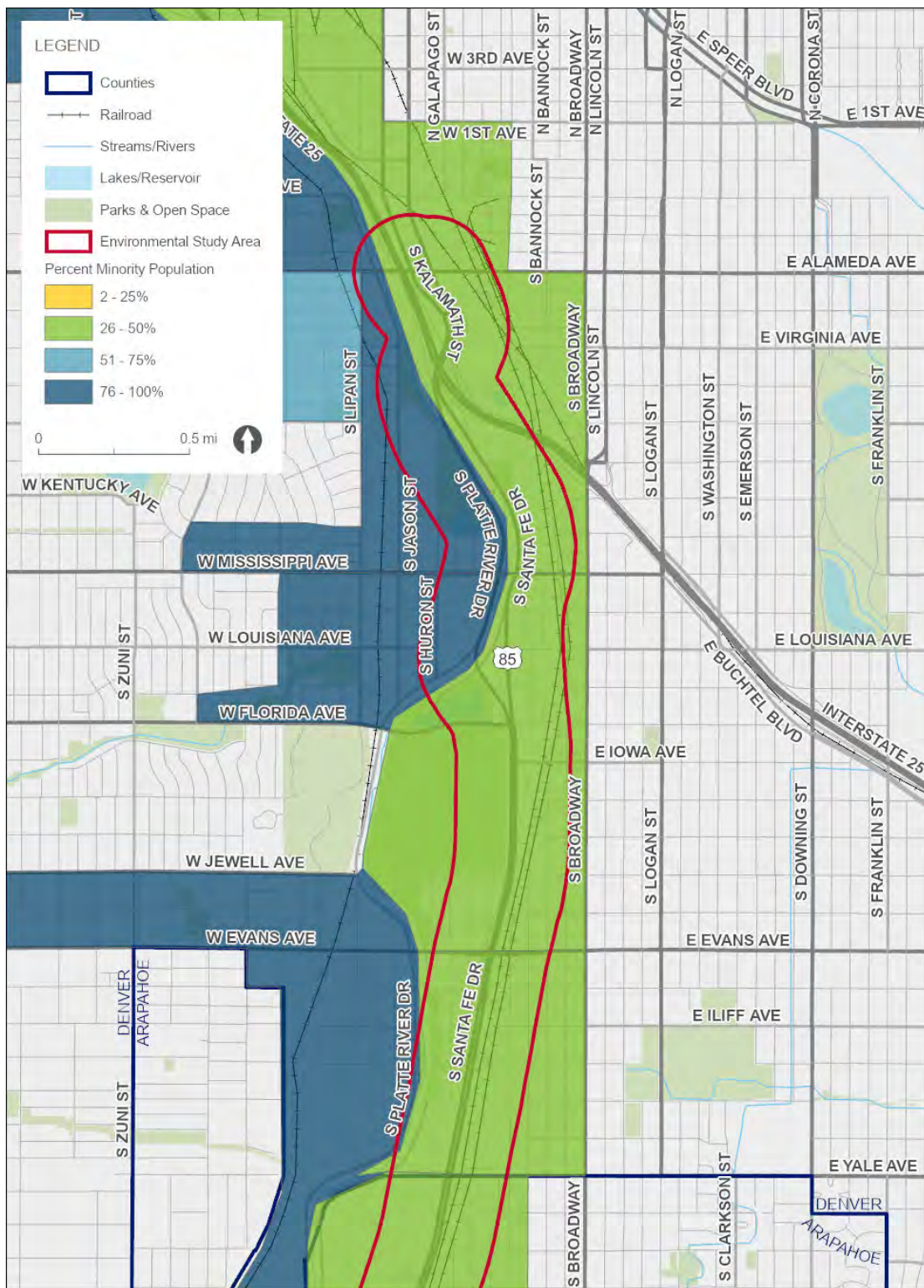


Figure 71. Minority Populations by Census Block Group (2 of 3)

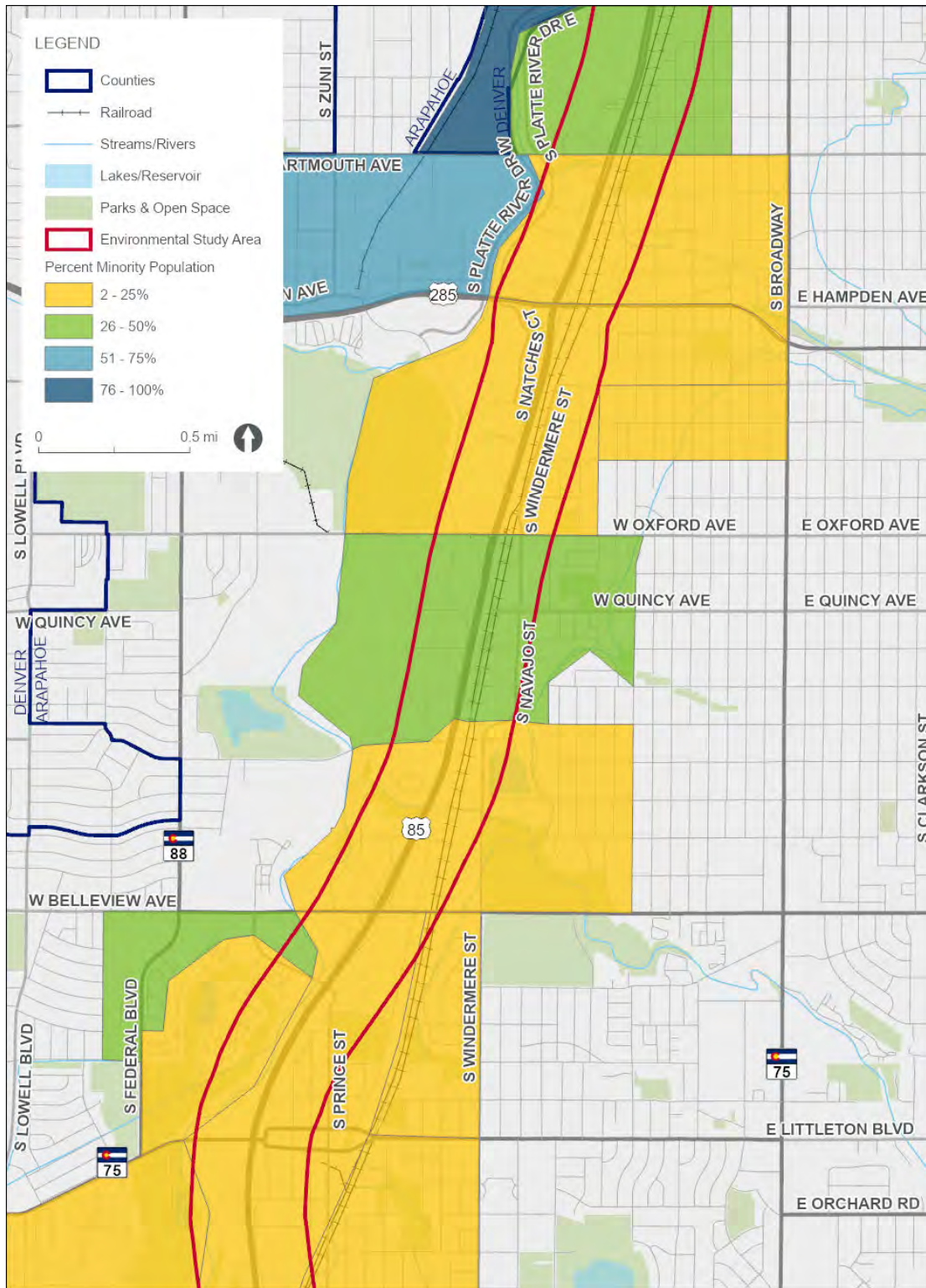


Figure 72. Minority Populations by Census Block Group (3 of 3)

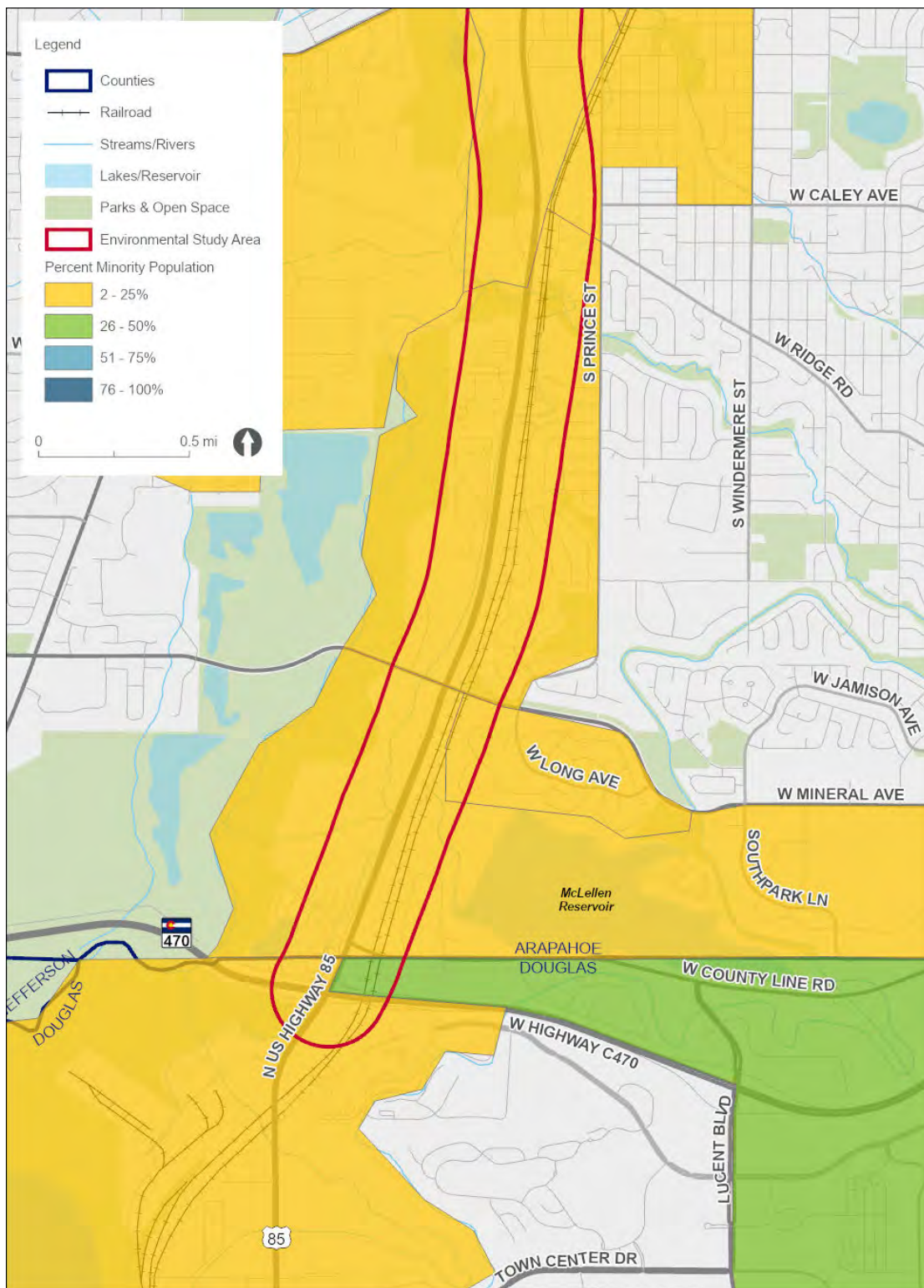


Figure 73. Low-Income Households by Census Block Group (1 of 3)

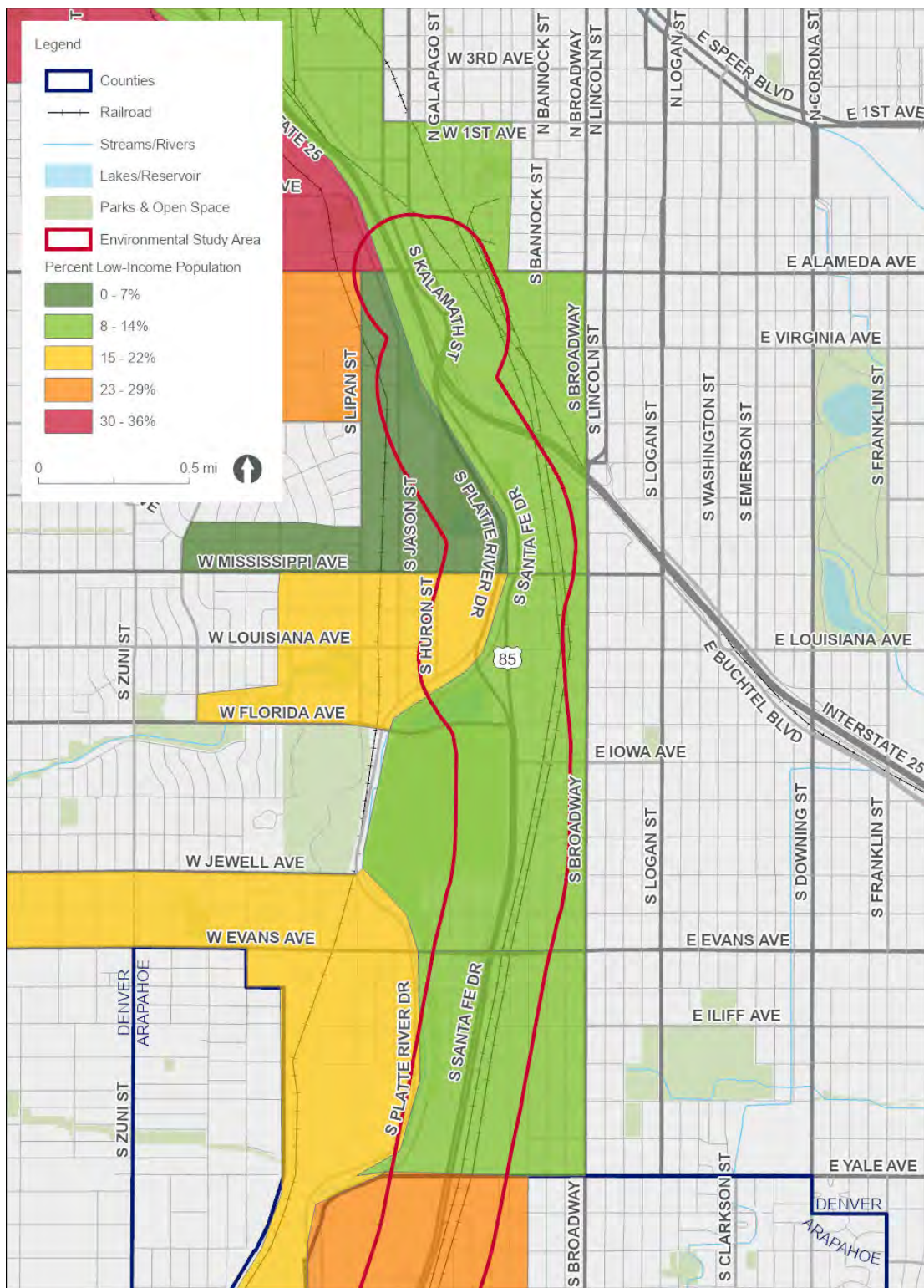
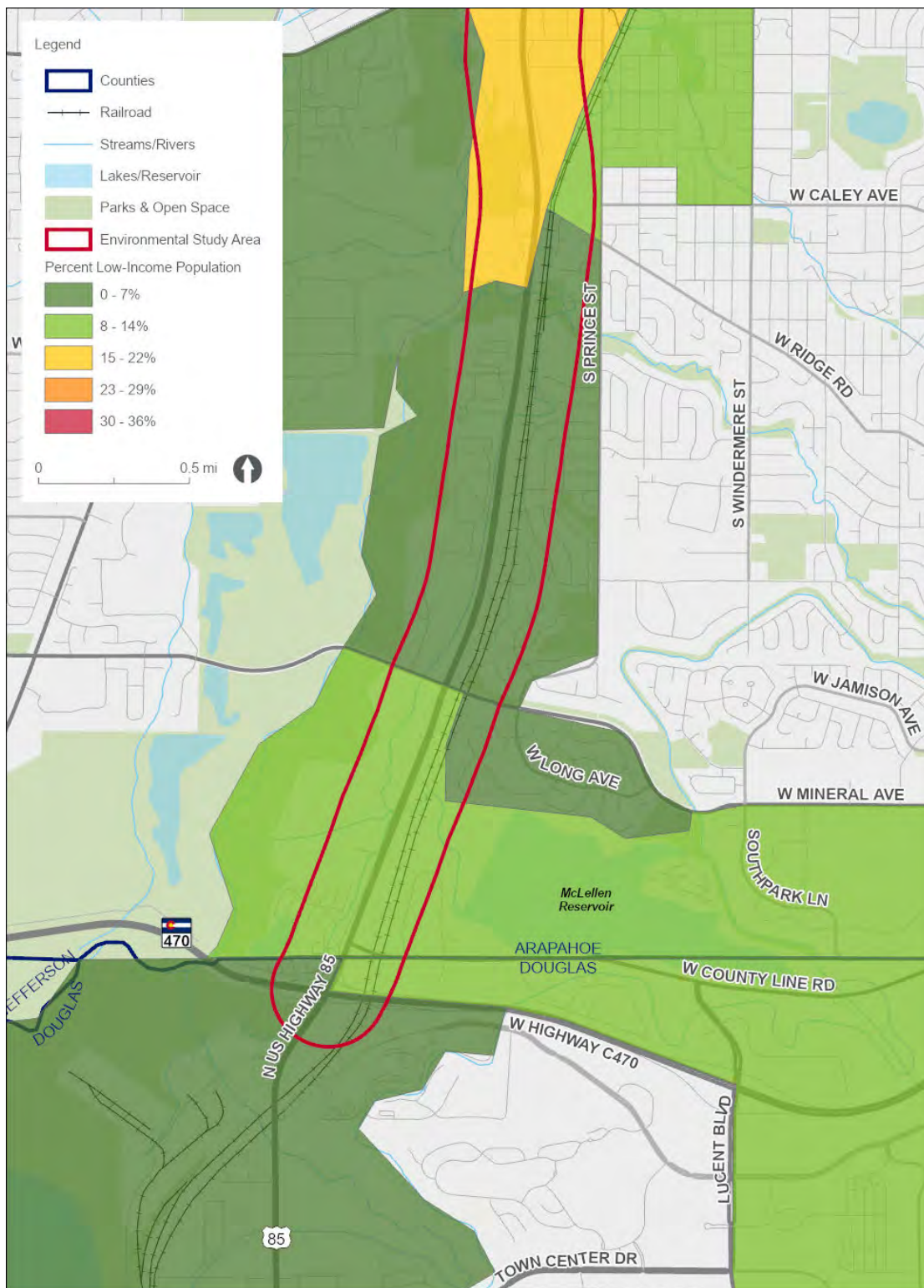


Figure 75. Low-Income Households by Census Block Group (3 of 3)



5.9.6 Recommendations

This preliminary demographic analysis of the Environmental Study Area for the *Santa Fe PEL Study (C-470 to I-25)* was completed for purposes of understanding the population and community facilities. The identified minority and low-income populations provide a reference to guide alternatives development and screening, and inform the environmental justice analysis to occur during NEPA.

Additional data analysis will need to be completed during the NEPA analysis. Low-income and minority populations will need to be presented in the context of the county where they exist, comparing the percentage of environmental justice populations in the project-specific study area to the county threshold. During NEPA, low-income populations should be defined by using U.S. Census household size data and income limits set by the HUD, called Extreme Low-Income Levels. HUD Extreme Low-Income Levels are determined by finding 30 percent of the median income for the appropriate county or counties and the average household size in the study area. Additional data collection to identify businesses, community facilities, and public services serving minority and low-income populations should be completed to evaluate and address adverse impacts to these entities.

The NEPA process will follow the CDOT *National Environmental Policy Act Manual, Version 6* (CDOT, 2020g), which requires the following information be determined and documented:

- Area of potential impact for the project and identification of minority and low-income populations and resources serving these populations within the defined study area.
- Opportunities for meaningful public participation, including targeted outreach to environmental justice populations early and throughout the project development process.
- Environmental effects of the project on all communities, including human health, economic, and social effects (negative and positive) on minority and low-income populations within the study area.
- Mitigation measures that are feasible for the project when impacts on minority or low-income populations are projected to be disproportionately high or adverse after considering offsetting benefits.
- Whether the impacts remain disproportionately high and adverse after mitigation (if applicable). If disproportionately high and adverse effects on minority or low-income populations exist after mitigation efforts, FHWA will not approve the project unless there is substantial need for it based on the overall public interest and alternatives that would have less adverse effects on the minority and low-income populations have other severe impacts or extraordinarily high costs.

5.10 Visual Resources

5.10.1 Brief Description of Resource Studied

Visual impacts caused by transportation improvements are seen both by people traveling on the road and by neighbors adjacent to it. Views to and from the road often create the basis for much of what we know about our everyday environment and for our mental image of our surroundings. A visual inventory was conducted for the Santa Fe corridor to identify the landscape character types of the foreground (within 0.5 mile), middleground (ranging from 0.5 to 5 miles), and background (greater than 5 miles to limits of visibility) views of the corridor, as defined in the *2019 CDOT Visual Impact Assessment Guidelines* (CDOT VIA Guidelines) (CDOT, 2019b).

5.10.2 Agencies Involved

- Federal Highway Administration
- Colorado Department of Transportation
- Local agencies
 - Arapahoe County
 - City and County of Denver
 - Douglas County
 - City of Englewood
 - City of Littleton
 - City of Sheridan

5.10.3 Relevant Guidance, Studies and Plans

- CDOT 2019 CDOT Visual Impact Assessment Guidelines (CDOT, 2019b)
- FHWA Guidelines for the Visual Impact Assessment of Highway Projects (FHWA, 2015b)
- CDOT Planning and Environmental Linkages (PEL) Handbook—Version 2 (CDOT, 2016e)
- CDOT Landscape Architecture Manual (CDOT, 2014)

The following plans relevant to the *Santa Fe PEL Study (C-470 to I-25)* contained guidance regarding visual considerations:

- Arapahoe County Open Space Master Plan (Arapahoe County, 2010a)
- I-25 Central Planning and Environmental Linkages (PEL) Study (CDOT, 2020a)
- *Blueprint Denver* (City and County of Denver, 2019)
- Envision Littleton Comprehensive Plan (City of Littleton, 2019a)
- Neighborhood Plans and Corridor Plans, A Section of the City of Littleton Comprehensive Plan (City of Littleton, 2016)
- South Santa Fe Corridor and Downtown Study: Technical Report (City of Littleton, 1999)

- Planning and Environmental Linkages (PEL) Report for the Douglas County US 85 Corridor Improvements Study (CDOT, 2016b)

5.10.4 Data Collected/Methodology

The visual resource study area is primarily focused on the foreground and background views to and from Santa Fe Drive. The study area for visual resources varied slightly from the Environmental Study Area. The visual resources study area boundaries were modified to include notable background views from multiple locations throughout the Santa Fe Drive corridor. The CDOT VIA Guidelines were followed in the collection of the visual resources. Data collection was completed with a Google Earth desktop analysis followed by a windshield survey of the corridor on June 18, 2020. The analysis identified visual elements that are both representative and unique to Santa Fe Drive. Review of the local plans did not have visual guidance specific to the Santa Fe Drive corridor but contained goals and objectives related to community character which may influence the nature of land use and visual character of the Environmental Study Area in the future.

5.10.5 Findings/Results

The visual resources in the Environmental Study Area are characterized as Urban General (with industrial) to Suburban Residential, as defined in the CDOT VIA Guidelines. The landscape character of the Santa Fe corridor is a transition from the more industrial urban area in the northern portion to a traditional suburban area in the southern portion. The industrial nature of the corridor is expressed through the proximity of the BNSF railroad to the east (in most locations) of Santa Fe Drive. The railroad has contributed to the type of businesses and buildings that rely on the railroad for their commerce. Progressing south, the landscape transitions to a traditional suburban residential setting. The transition from industrial urban to traditional suburban has occurred over decades. Some of the characteristics of the traditional suburban setting are strip malls, big-box retail, transition retail (retail that occupies converted residential), shopping complexes, large acreage businesses, multifamily residential, and single-family residential with green spaces, yards and tree coverage.

The roadway is partially surrounded by buildings, highway infrastructure, and railroad infrastructure. The visual quality of the corridor is defined by an inharmonious foreground with distinct and vivid background views of the Colorado Front Range Mountains. There are select feature views of the Colorado Front Range Mountains in the background in several locations. Viewers to and from the corridor are neighbors and travelers. Middleground views were determined not to have a significant impact on the visual quality of the corridor and therefore are not addressed in the findings.

Neighbors are classified as residential, retail, businesses, and other facilities that people occupy adjacent to Santa Fe Drive. Both non-residential and residential neighbors along the corridor value the views of the Colorado Front Range Mountains. Neighbors would be less impacted by changes to views to the east, north, and some south views. Alterations of views to the west toward the Colorado Front Range Mountains (background views) could have substantive visual impacts on neighbors.

Travelers are classified as people moving through the corridor via multiple modes of transportation. Automobile travelers would be the least sensitive to visual changes in the corridor. RTD light rail travelers would be the most sensitive to visual changes in the corridor. Pedestrians and people recreating would have a moderate level of sensitivity based on the duration of their views.

5.10.6 Recommendations

Where the vertical elevation is anticipated to increase (e.g., bridges, overpasses, etc.) or vertical elements are anticipated to be located (e.g., signs, tolling infrastructure, etc.), the background views of the Colorado Front Range mountains will need to be evaluated during NEPA. The CDOT VIA Guidelines detail how to document the appropriate level of study and documentation required for NEPA and the necessary steps to complete the visual impact assessment.

Corridor design guidelines need to conform to local agency design guidelines. Design elements to consider are those that increase the visual harmony with a unified landscape composition throughout the corridor to enhance background and foreground views. Gateway features located along the corridor would add to the sense of place.

Mitigation measures should be identified during NEPA to avoid or minimize impacts to the background views of the Colorado Front Range Mountains should be considered.

5.11 Historic Resources

5.11.1 Brief Description of Resource Studied

Historic resources include sites, buildings, structures, objects, and districts that are significant to history or prehistory. The significance of historic resources are usually determined in their eligibility for or listing in the National Register of Historic Places (NRHP), the Colorado State Register of Historic Properties, or as local historic landmarks. Types of historic resources within the Environmental Study Area, include buildings, railroads, irrigation ditches, bridges, and culverts.

5.11.2 Agencies Involved

These agencies and potentially additional stakeholders have either management or regulatory responsibilities regarding historic resources or are interested in the management and preservation of historic resources and would also be involved in Section 106 consultations on future projects.

- Federal Highway Administration
- Colorado Department of Transportation
- Colorado Office of Archaeology and Historic Preservation
- Identified tribes with an interest in the area
- U.S. Army Corps of Engineers
- Local agencies

5.11.3 Relevant Regulations, Guidance, Studies, and Plans

Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to consider the effects on NRHP-listed or NRHP-eligible properties when they are funding or permitting a project. For transportation projects involving federal funds from the FHWA, CDOT acts on behalf of the FHWA to meet Section 106 requirements. For undertakings where CDOT is the lead agency, resources that are 45 years of age or older are included in study and survey areas. Under Section 106, the lead federal agency determines whether it has an undertaking that could affect historic resources. If so, the agency defines the Area of Potential Effects (APE), the area in which an undertaking may directly or indirectly cause changes in the character or use of historic resources. Once the APE has been defined, the agency then consults with the appropriate State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer on effects to historic or potentially historic resources within the APE. History Colorado's Office of Archaeology and Historic Preservation (OAHP) serves as the SHPO.

Section 4(f) of the Department of Transportation Act (1966) prohibits the USDOT from using parks, recreation areas, wildlife and water fowl refuges, and historic properties unless there is no feasible and prudent alternative to that use and the action includes all possible planning to minimize harm to the property resulting from such a use. A use under Section 4(f) for historic properties is typically triggered by an adverse effect determination under Section 106 or occupancy of a historic property for a transportation purpose.

A file search with the OAHP indicated that there have been 35 previous historic resources surveys within the Environmental Study Area. Many of the previous surveys identified in the OAHP database are over 10 years old and may not meet current OAHP standards for cultural resource surveys and/or may cover areas that now contain historic resources 45 years of age or older that were not surveyed previously. Correspondence with CDOT historians indicated five additional historic resource surveys were recently completed that fall within or are in proximity to the Environmental Study Area. These surveys have SHPO concurrence on determinations of eligibility and project effects. In addition, historic building surveys have been conducted for the City of Littleton, and the data associated with those surveys are in the OAHP database. All previous survey data will be used during subsequent phases of the project to develop appropriate historical contexts for evaluating NRHP eligibility.

Additional studies and plans relevant to the corridor that account for or include considerations for historic resources include:

- Envision Littleton Comprehensive Plan (City of Littleton, 2019a)
- Englewood Forward Comprehensive Plan (City of Englewood, 2016)
- Sheridan Comprehensive Plan (City of Sheridan, 2015)

5.11.4 Data Collected/Methodology

A Compass file search was conducted of records on file with the Colorado OAHP in May 2020. This search returned previous survey and historic resource data within the Environmental Study Area. Those data were used to identify existing historic resources, related prior surveys, and

NRHP eligibility status. Because the OAHP database does not contain information for recent surveys and/or information on local landmarks, more recent survey data and landmark information was gathered from CDOT historians and local municipality landmark lists. Data provided by CDOT included recent Section 106 correspondence and associated survey reports, memoranda, and inventory forms. Appendix J includes a table of previously identified historic resources that is the compilation of these three sources of information.

In addition to the Compass file search and data provided by CDOT and the City of Littleton, county parcel data was analyzed to identify areas and neighborhoods containing buildings constructed in three eras—prior to World War II, the post-World War II to 1976 period, and since 1976. A 1.0-mile buffer of the corridor was used to account for neighborhoods extending beyond the Environmental Study Area, to provide a more complete view of historical development along the corridor, and to inform analyses for future projects in the corridor that may extend east-west beyond the current Environmental Study Area. This data shows the patterns of development in the corridor and shows which areas may contain previously not identified historic resources that may require additional survey and analysis during future project phases.

5.11.5 Findings/Results

The OAHP file search, data provided by CDOT, and City of Littleton data identified 351 known historic resources in the Environmental Study Area. These resources include districts, residential and commercial buildings, roads, railroads, bridges/overpasses/underpasses, culverts, ditches, and parks. Table 24 summarizes the NRHP eligibility statuses of historic resources previously identified and documented in the Environmental Study Area. The statuses used in Table 24 refer to the NRHP status, unless noted. Officially Eligible properties have been determined eligible with SHPO concurrence and require the same effects analysis under Section 106 as NRHP-listed properties. Contributing and Noncontributing apply to properties within a NRHP-listed or Officially Eligible historic district. Field assessments have not been concurred with by SHPO and typically require reevaluation, as do Officially Needs Data properties. Linear resources are treated as NRHP-eligible unless the entire resource has been documented and evaluated. Segments of linear resources are recorded in lieu of the entire resource and evaluated as supporting or not supporting the eligibility of the overall linear resource. The known historic resources are shown in Figure 76 through Figure 78.

Table 24. Summary of National Register Status of Historic Properties and Locally Designated Historic Properties

National Register of Historic Places Listed	2	Officially Needs Data	2
State Register of Historic Properties Listed	1	Field Not Eligible	190
Officially Eligible	23	No Assessment	8
Contributing/Noncontributing	19/7	Officially Not Eligible	54
Field Eligible	9	Linear Resources (Segments)	6 (36)*
Local Landmark Designation	16		

*One locally designated landmark is also NRHP-listed.

Figure 77. NRHP-Listed, NRHP-Eligible, Locally Designated, and Previously Identified (Field or No Assessment) Properties (2 of 3)

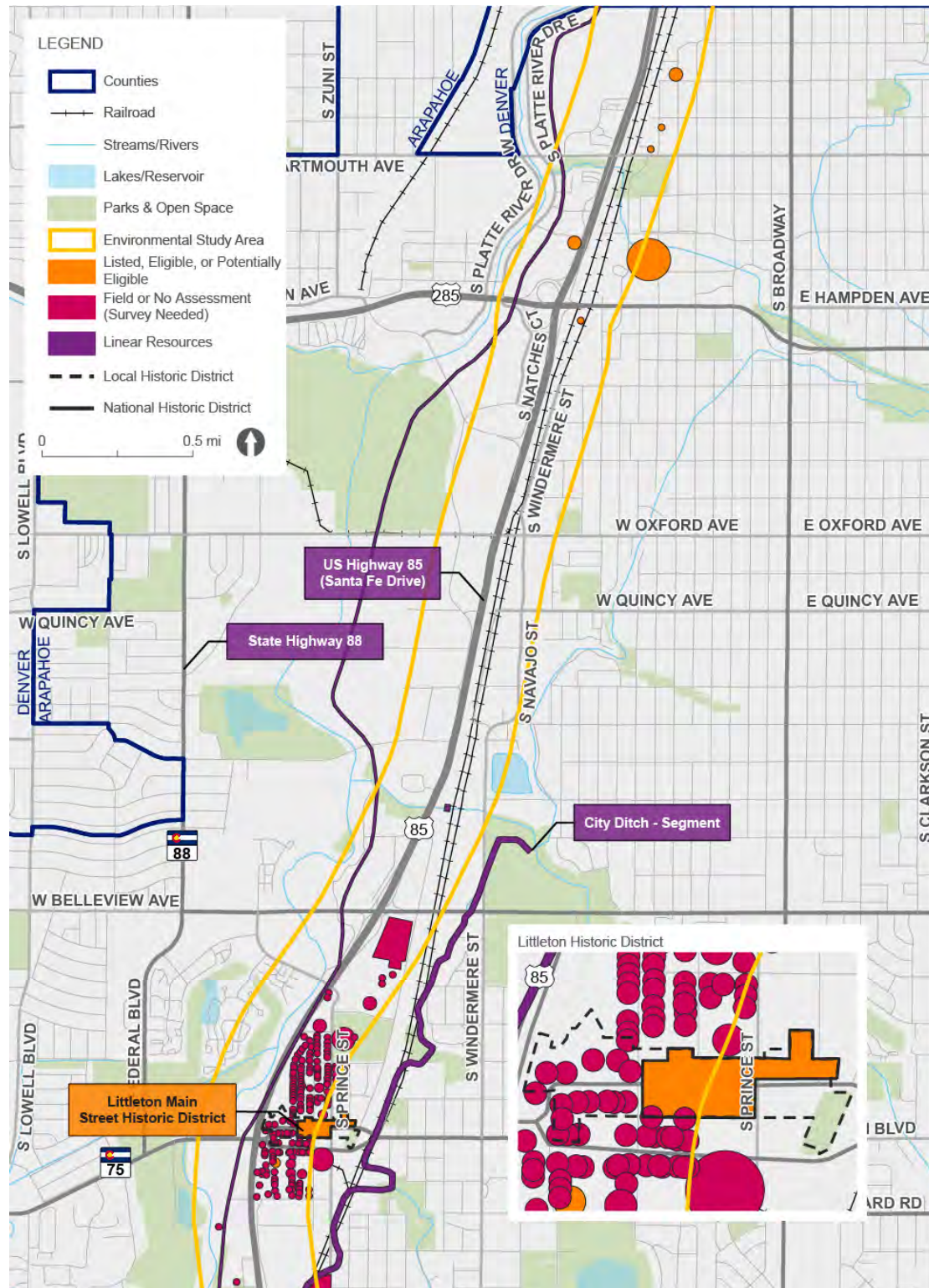
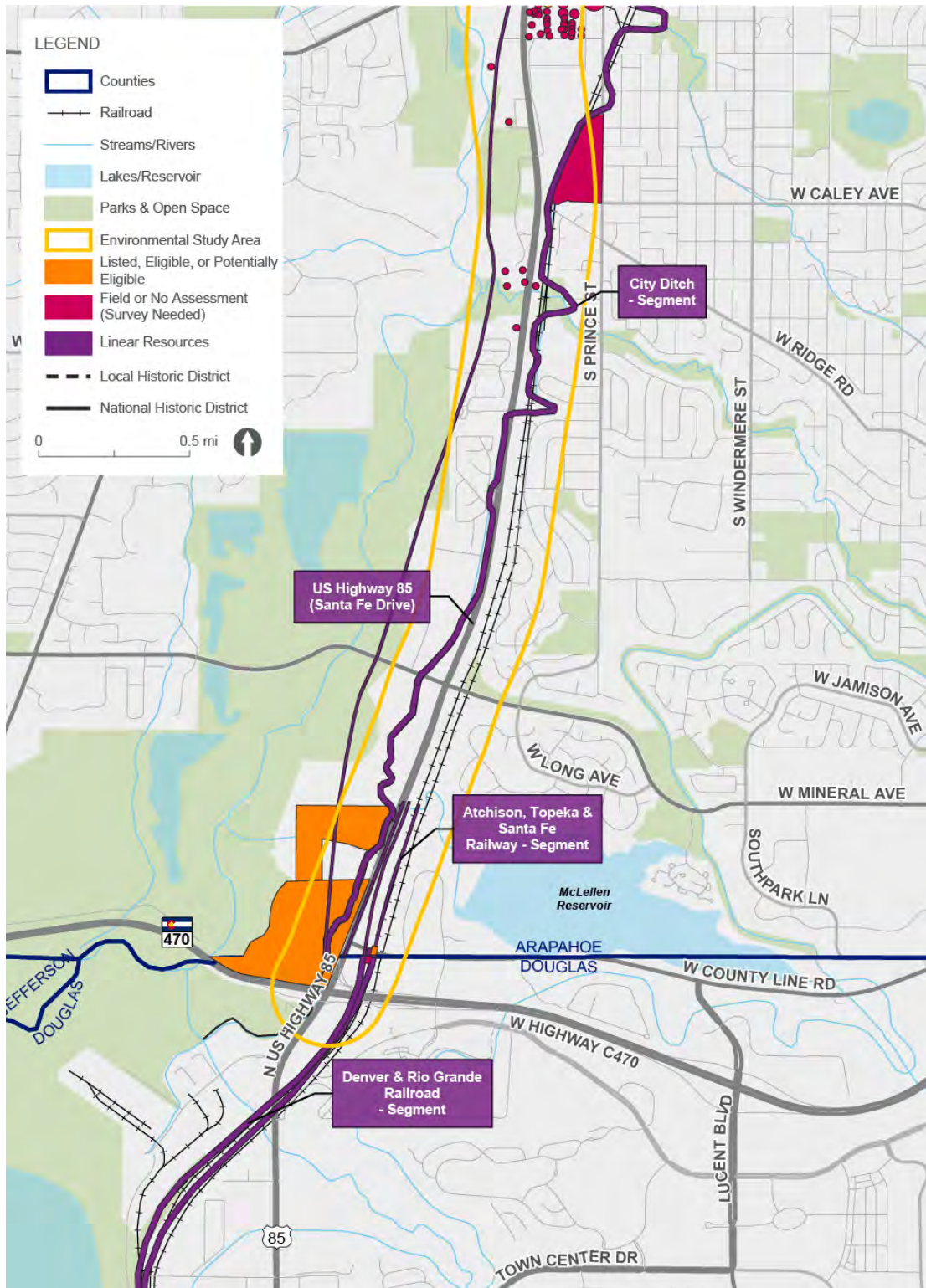


Figure 78. NRHP-Listed, NRHP-Eligible, Locally Designated, and Previously Identified (Field or No Assessment) Properties (3 of 3)



Included in the categories of properties in Table 24 is the NRHP-listed and local landmark-designated Littleton Main Street Historic District. The district consists of contributing and noncontributing commercial buildings along W. Main Street between Santa Fe Drive and S. Rio Grande Street. The district boundaries also include nine locally landmarked buildings and one NRHP-listed building.

There are historic linear resources (e.g., roads, railroads, ditches, etc.) throughout the Environmental Study Area. US Highway 85 (Santa Fe Drive), State Highway 88, and the railroads (Denver & Rio Grande and Atchison, Topeka & Santa Fe) are historically significant resources. The City Ditch is within the Environmental Study Area and has not been recorded in its entirety. It is treated as eligible for NRHP listing.

The Environmental Study Area includes NRHP-listed, NRHP-eligible, and potentially eligible properties, in addition to properties that have previously been identified but have no official determination. Several linear historic resources, including Santa Fe Drive, run the length of the Environmental Study Area. Concentrations of known historic properties are found in the Denver County portion of the Environmental Study Area and in the vicinity of downtown Littleton. Additionally, the analysis of assessor's data identified concentrations of buildings and neighborhoods within the Environmental Study Area that were constructed prior to World War II, post-World War II to 1976 period, and since 1976 (Figure 79 through Figure 81). Generally, the analysis shows a progression of development over the twentieth century from the north to the south end of Environmental Study Area, with a few exceptions. Downtown Littleton includes properties constructed in all three eras. There are also isolated parcels in the south end of the Environmental Study Area that depict the area's rural nature and agricultural functions prior to extensive development in the latter half of the twentieth century.

5.11.6 Recommendations

Recommended future projects within the Environmental Study Area may require compliance with NEPA, Section 106, and Section 4(f) of the Department of Transportation Act. If the lead federal agency determines a project is an undertaking under Section 106, an APE would be delineated specific to the parameters and scope of that project. Identification and evaluation surveys of historic resources within a project-specific APE may be necessary to determine what historic resources may be potentially affected by the project. If adverse effects are determined during Section 106, the lead agency, in consultation with stakeholders, will work to minimize and mitigate effects.

In addition to federal and state laws and regulations, local jurisdictions may have ordinances and regulations that must be followed. Design solutions should seek ways to avoid or minimize impacts to historic resources if possible. For alternatives with significant impacts, the lead agency will provide a discussion of practicable alternatives or mitigation. Where avoidance is not possible, effects to historic resources could add delay in NEPA clearance and add time to a specific project- schedule during and subsequent to NEPA.

Figure 79. Construction Eras of Parcels and Neighborhoods (1 of 3)

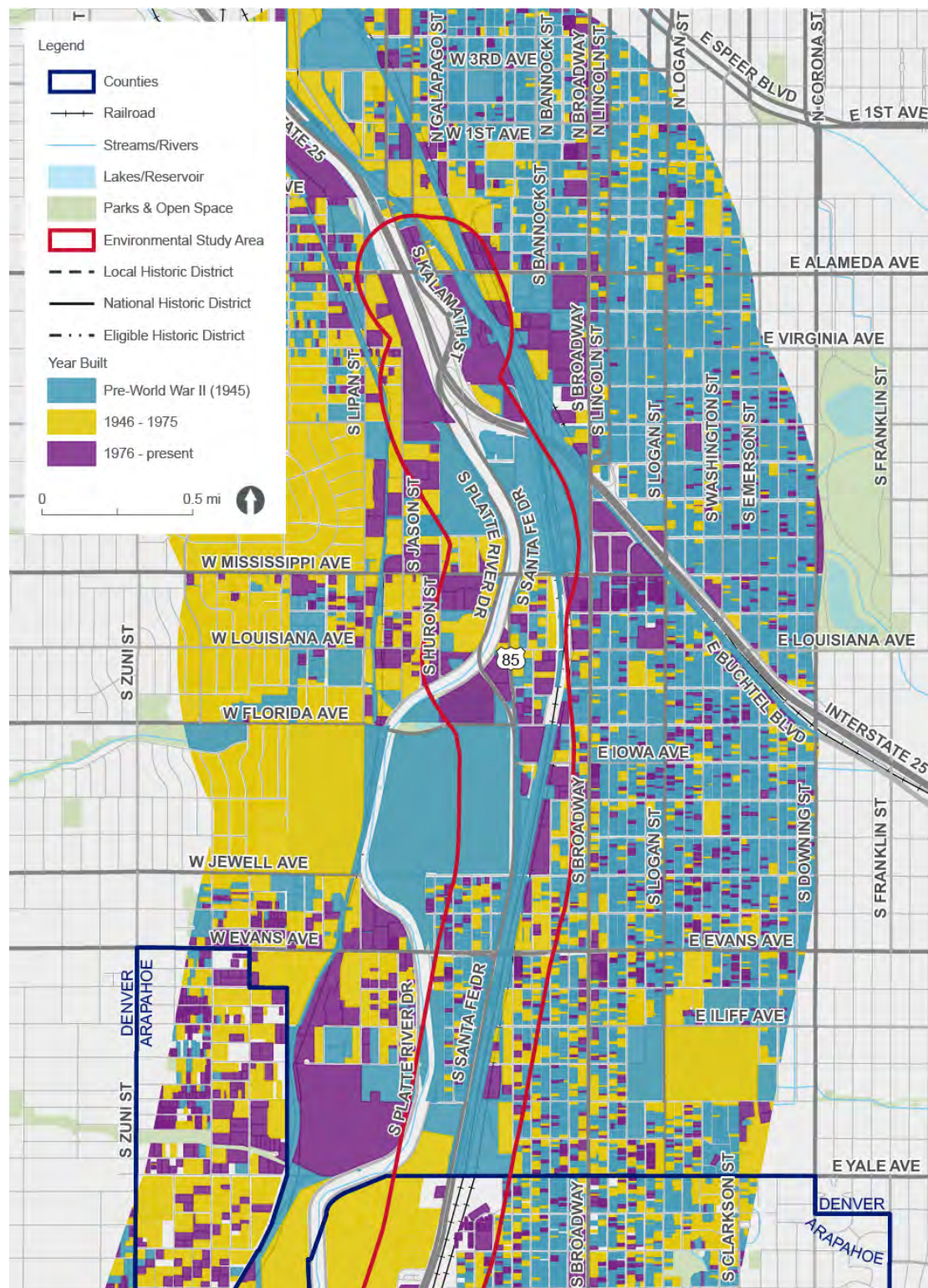


Figure 80. Construction Eras of Parcels and Neighborhoods (2 of 3)

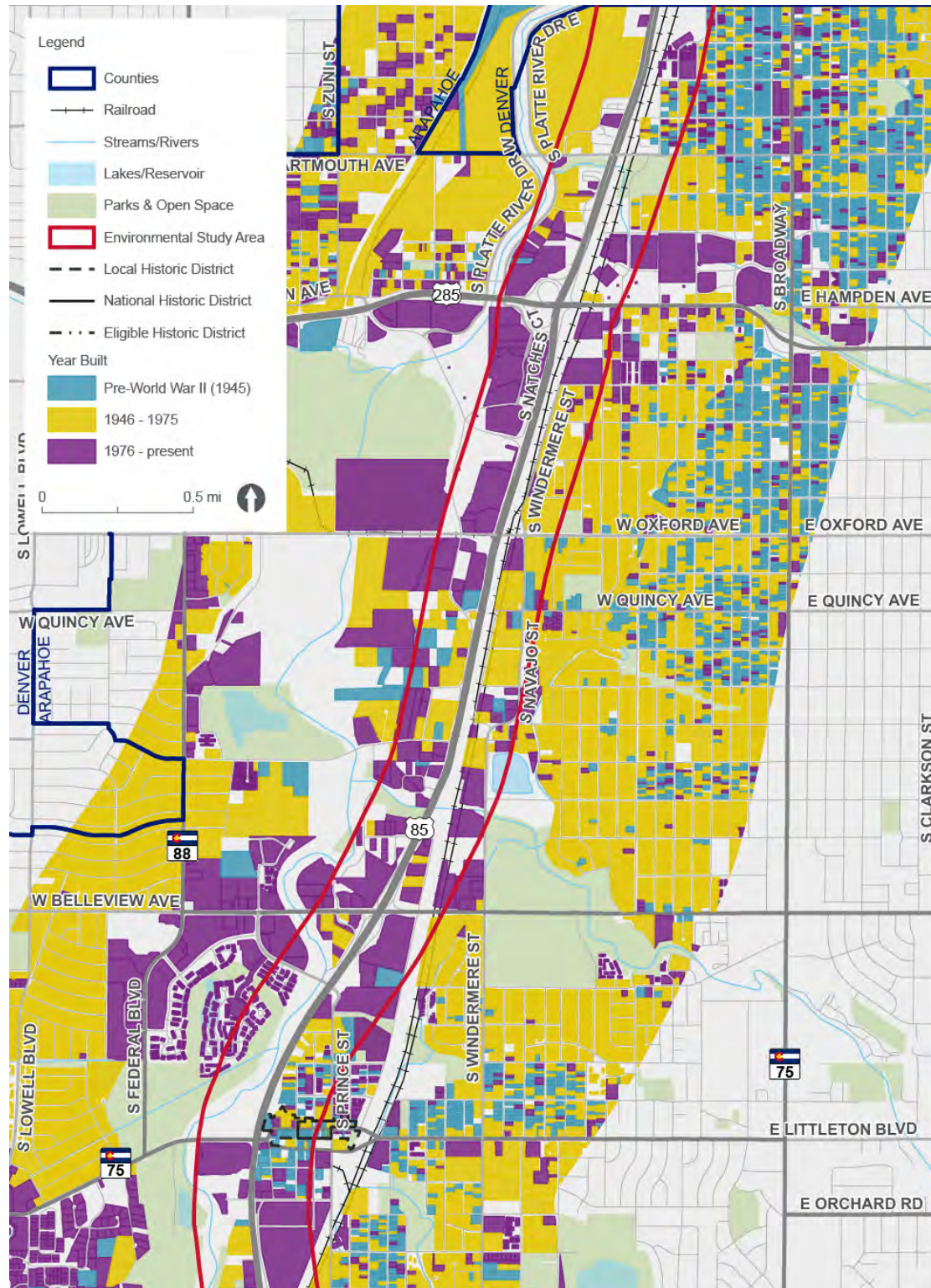
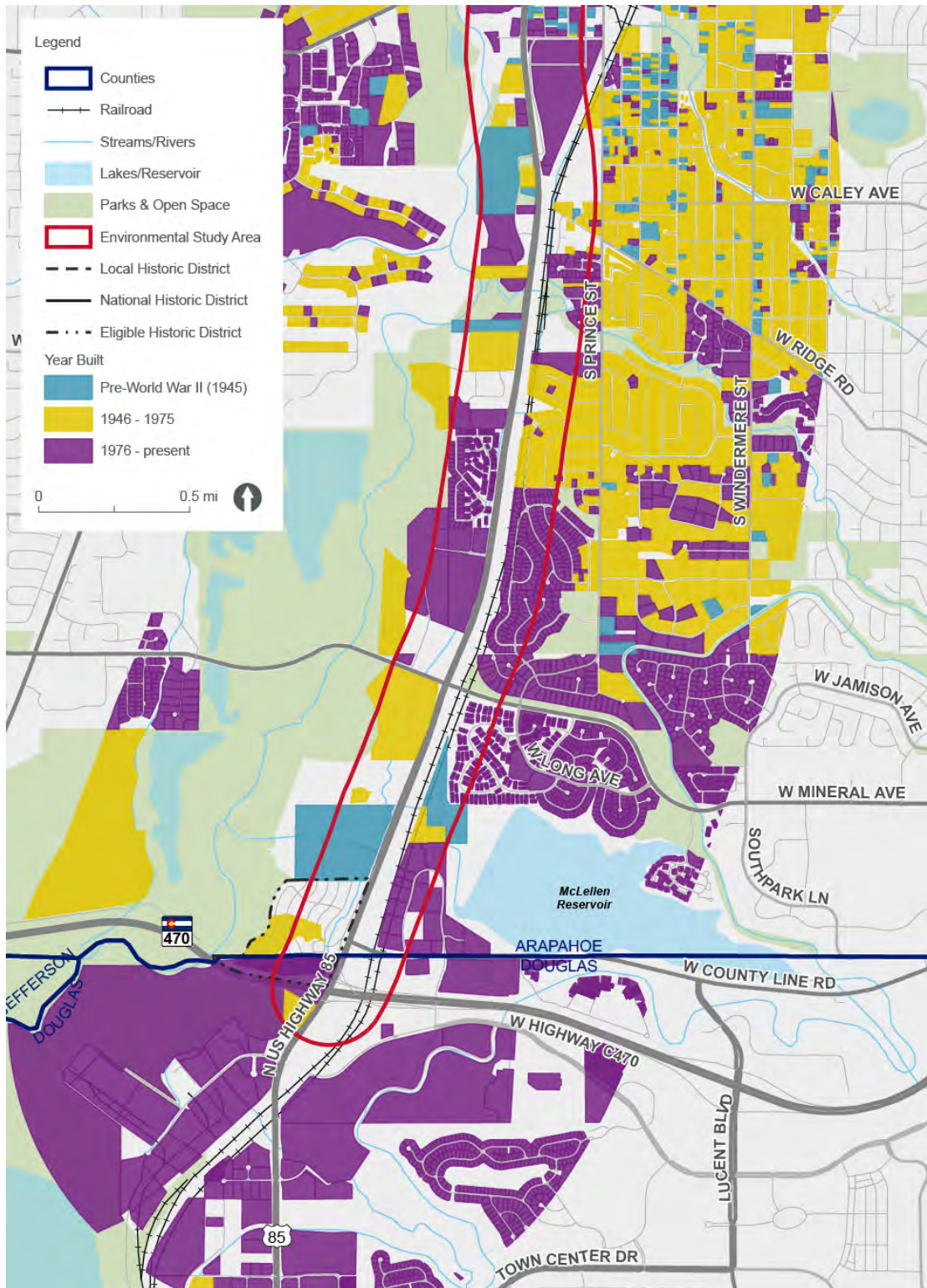


Figure 81. Construction Eras of Parcels and Neighborhoods (3 of 3)



5.12 Archaeological and Paleontological Resources

5.12.1 Archaeological

Archaeological resources are defined as material evidence of human activity. They range in time from prehistoric periods to modern day. Under current regulations, archaeological resources can be treated as historic properties if they meet one of the four criteria needed for listing on the NRHP (36 CFR 60.4). For the purposes of the *Santa Fe PEL Study (C-470 to I-25)*, linear features, such as roads and railroads, are excluded from archaeological resources and considered historic resources.

A Compass file search was conducted of records on file with the Colorado OAH in May 2020. The file search resulted in one known archaeological resource within the Environmental Study Area. The need and extent of archeology surveys should be determined in the future and based on the scope and design of future projects during NEPA. If an archaeological resource is discovered during construction, construction would need to stop and coordination with the state archeologist should occur. This could delay the project construction schedule.

5.12.2 Paleontological

Paleontological resources include fossils (the remains and traces of once-living organisms, preserved in the rock record) and the rocks surrounding those fossils that provide context. Because fossil organisms are, for the most part, extinct, no further fossils of those organisms will ever be formed; therefore, fossils are considered to be a non-renewable resource, protected under various state and federal laws and regulations.

No paleontological surveys were completed as part of this Corridor Conditions Report. During NEPA the need and extent of paleontological surveys should be determined in the future and be based on the project-specific scope and a review of the Potential Fossil Yield Classification, which classifies geological units based on the likelihood of finding scientifically important fossils in each unit.

In the event that scientifically important fossils are discovered, they would need to be removed from the work site to a repository museum for further study. Any discovery of a fossil may cause delay to the project schedule and additional consideration of mitigation requirements.

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